DEPARTMENT OF THE AIR FORCE

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AFIT/GAE/AA/82D-28

WIND TUNNEL TEST OF A C-18 AIRCRAFT
MODIFIED WITH THE ADVANCED RANGE
INSTRUMENTATION AIRCRAFT RADOME

THESIS

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THESIS

Presented to the Faculty of the School of Engineering
of the Air Force Institute of Technology
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Master of Science

by

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Preface

In this thesis I examined the effect of a large blunt nosed radome on the longitudinal/directional stability of a C-18 aircraft. My evaluation was based on data gathered from low speed wind tunnel testing of a model Boeing 707-320B aircraft configured with and without the large radome.

Since manufacturing a wind tunnel model is generally quite expensive and time consuming, the feasibility of this thesis was largely determined by the availability of a low cost, readily available model. In 1976 M. Skujins concluded, based on the results of a C-141 low speed wind tunnel test using a model constructed from a 1/108 scale vacuform hobby kit, that commercial hobby kits are a potential source for accurate low cost wind tunnel models. Based largely on M. Skujins' test results, I determined that a commercially available 1/100 scale Boeing 707-320B vacuform hobby kit would be adequate for my purpose. Of course this was also due to the fact that there are no significant external differences between C-18 and Boeing 707-320B aircraft.

In light of the small scale model and my desire to have a moveable rudder and horizontal stabilizer, considerable credit must go to Mr. Jack Tiffany who converted the plastic hobby kit into a wind tunnel test article complete with the moveable control surfaces mentioned. I also wish to express appreciation to Mr. Scotty Whitt and Mr. Nick Yardich, wind

tunnel technicians, whose cumulative knowledge, experience, and concerted efforts are best represented by the high quality of the data. Their skills, gained over years of experience, and diligence are one of AFIT's most valuable assets. Great appreciation is also extended to Professor Harold C. Larsen who provided valuable insight and guidance together with my advisor, Maj Michael L. Smith. The most credit of all must go to my wife, Tricia, who not only put up with my various moods during the 11 months spent on this project, but provided constant support and encouragement.

TABLE OF CONTENTS

Page

List of Figures

Figure		Page

Figure		Page
D-22	C_D vs C_L^2, Stabilizer -2.0 Degrees	68
D-23	C_D vs C_L^2, Stabilizer -6.0 Degrees	69
D-24	C_D vs C_L^2, Stabilizer -10.0 Degrees	70
D-25	C_D vs β, Rudder 0.0 Degrees	71
D-26	C_D vs β, Rudder 5.0 Degrees	72
D-27	C_D vs β, Rudder 15.0 Degrees	73
D-28	C_D vs β, Rudder 25.0 Degrees	74
D-29	C_D vs β, Rudder -5.0 Degrees	75
D-30	C_D vs β, Rudder -15.0 Degrees	76
D-31	C_D vs β, Rudder -25.0 Degrees	77
D-32	$dC_N/d\beta$ vs β, Rudder 0.0 Degrees	78
D-33	$dC_N/d\beta$ vs β, Rudder 5.0 Degrees	79
D-34	$dC_N/d\beta$ vs β, Rudder 15.0 Degrees	80
D-35	$dC_N/d\beta$ vs β, Rudder 25.0 Degrees	81
D-36	$dC_N/d\beta$ vs β, Rudder -5.0 Degrees	82
D-37	$dC_N/d\beta$ vs β, Rudder -15.0 Degrees	83
D-38	$dC_N/d\beta$ vs β, Rudder -25.0 Degrees	84
D-39	C_Y vs β, BASIC Configuration	85
D-40	C_Y vs β, BASIC Configuration	86
D-41	$dC_Y/d\beta$ vs β, Rudder 0.0 Degrees	87
D-42	$dC_Y/d\beta$ vs β, Rudder 5.0 Degrees	88
D-43	$dC_Y/d\beta$ vs β, Rudder 15.0 Degrees	89
D-44	$dC_Y/d\beta$ vs β, Rudder 25.0 Degrees	90
D-45	$dC_Y/d\beta$ vs β, Rudder -5.0 Degrees	91

List of Symbols

a	Lift Curve Slope
AFIT	Air Force Institute of Technology
α	Fuselage reference line angle of attack (degrees)
α_g	Angle between fuselage reference line and tunnel axis (degrees)
ARIA	Advanced Range Instrumentation Aircraft
b	Wing Span
BASIC	Standard Boeing 707-320C aircraft
β	Sideslip angle (degrees)
β_g	Angle between fuselage reference line and tunnel axis (degrees)
C	Wind tunnel cross sectional area
C_D	Drag coefficient ($D/\frac{1}{2}$ QS)
C_{Di}	Induced drag coefficient (KC_L^2)
C_{Do}	Zero lift drag coefficient from C_D vs C_L^2 plot
C_{Dt}	Trim drag coefficient
C_{Du}	Uncorrected drag coefficient
C_L	Lift coefficient ($L/\frac{1}{2}$ QS)
C_{L_α}	$dC_L/d\alpha$ (per degree)
C_{Lt}	Trimmed lift coefficient
C_{Lu}	Uncorrected lift coefficient
CG	Aircraft center of gravity
C_M	Pitching moment coefficient ($M/\frac{1}{2}$ QS MAC)
C_{Macwb}	Wing body pitching moment coefficient

C_{M_α}	$dC_M/d\alpha$ (per degree)
$C_{M_{C_L}}$	dC_M/dC_L
C_{Mu}	Uncorrected pitching moment coefficient
C_N	Yawing moment coefficient ($N/\frac{1}{2}$ QSb)
C_{N_β}	$dC_N/d\beta$ (per degree)
C_T	Thrust coefficient
C_Y	Sideforce coefficient ($Y/\frac{1}{2}$ QSb)
C_{Y_β}	$dC_Y/d\beta$ (per degree)
δ	Boundary correction factor
δC_{DB}	C_D ARIA - C_D BASIC
δC_{DW}	Wing wake blocking correction
$\Delta C_{M_{C_L}}$	C_L BASIC - C_L ARIA
δD_b	Bouyancy correction
D_M	Measured drag less wire drag
D_u	Uncorrected drag
D_{WIRE}	Wire drag
ε	Total blocking increment
ε_{sb}	Total solid blocking increment
ε_{wb}	Total wake blocking increment
ε_{sbB}	Body solid blocking increment
ε_{sbW}	Wing solid blocking increment
F_L	Wind tunnel front lift measurement
fps	Feet per second
h	Aircraft CG position (percent MAC)

h_n	Aircraft neutral point location (percent MAC)
h_{nwb}	Wing body neutral point (percent MAC)
K	Drag Ploar Slope
K_1	Wing shape factor
K_3	Body shape factor
K_n	Static margin
L_u	Uncorrected lift
M	Pitching Moment
MAC	Mean aerodynamic cord
MPH	Miles per hour
PSF	Pounds per square foot
N	Yawing Moment
Q	Dynamic pressure
Q_u	Uncorrected dynamic pressure
R_e	Reynolds Number
R_L	Wind tunnel measured rear lift
S	Model wing planform area
τ_{1F}	Tunnel shape vs zero span factor
τ_{1W}	Tunnel shape vs wing span factor
τ_2	Downwash correction factor
V_h	Tail volume ratio
Y	Side Force

NOTE: All derivatives except dC_M/dC_L are partial derivatives

Abstract

The Air Force intends to modify Boeing 707-320C aircraft (Air Force designation, C-18) with the large blunt nosed Advance Range Instrumentation Aircraft (ARIA) radome formerly installed on EC-135 aircraft. This modification will significantly increase fuselage area forward of the aircraft center of gravity and is expected to reduce longitudinal and directional stability, and increase drag. These anticipated aerodynamic changes were evaluated from data gathered on a modified (ARIA) and unmodified (BASIC) 1/100 scale model C-18 tested in the AFIT five foot low speed wind tunnel. Longitudinal data were gathered from -4 to +18 degrees angle of attack (α) at fixed stabilizer angles from -10 to +7 degrees. Directional data were gathered from -6 to +6 degrees of sideslip at fixed rudder angles from -25 to +25 degrees. At trim, longitudinal static stability for ARIA was slightly less than BASIC. $\Delta dC_M/dC_L$ was on the order of .03 at -.2 C_{Lt} and .8 C_{Lt} and was on the order of .01 to .001 from .2 to .5 C_{Lt}. Below 12 degrees α a higher α was required for ARIA than BASIC to achieve the same C_L. The change in drag appeared to be less than the accuracy of the drag measurement system and could not be quantified. The change in Directional static stability was insignificant.

I. Introduction

Background

In 1981 the 4950th Test Wing, Wright-Patterson AFB, Ohio, began the acquisition of Boeing 707-320C commercial aircraft. These aircraft will replace the current fleet of EC-135 Advanced Range Instrumentation Aircraft (ARIA). A number of the Boeing 707-320C aircraft (Air Force designation - C-18) will be fitted with the large ARIA radome (see Figs 1 and 2) previously fitted to the EC-135 ARIA aircraft.

Problem

Since the addition of the ARIA radome significantly increases fuselage area well forward of the aircraft center of gravity (CG), a reduction in longitudinal and directional stability was expected. Furthermore, since the C-18 is a larger version of the EC-135 (see Appendix F for dimensions) it was further anticipated that C-18 vs C-18 ARIA stability differences would not necessarily correspond with EC-135 vs EC-135 ARIA stability differences.

Objective

This study was undertaken to evaluate the change in static stability of the C-18 aircraft due to addition of the ARIA radome. Data for the evaluation were obtained from wind tunnel experiment using a 1/100 scale model in the AFIT

Fig. 1. Model C-18, BASIC Configuration

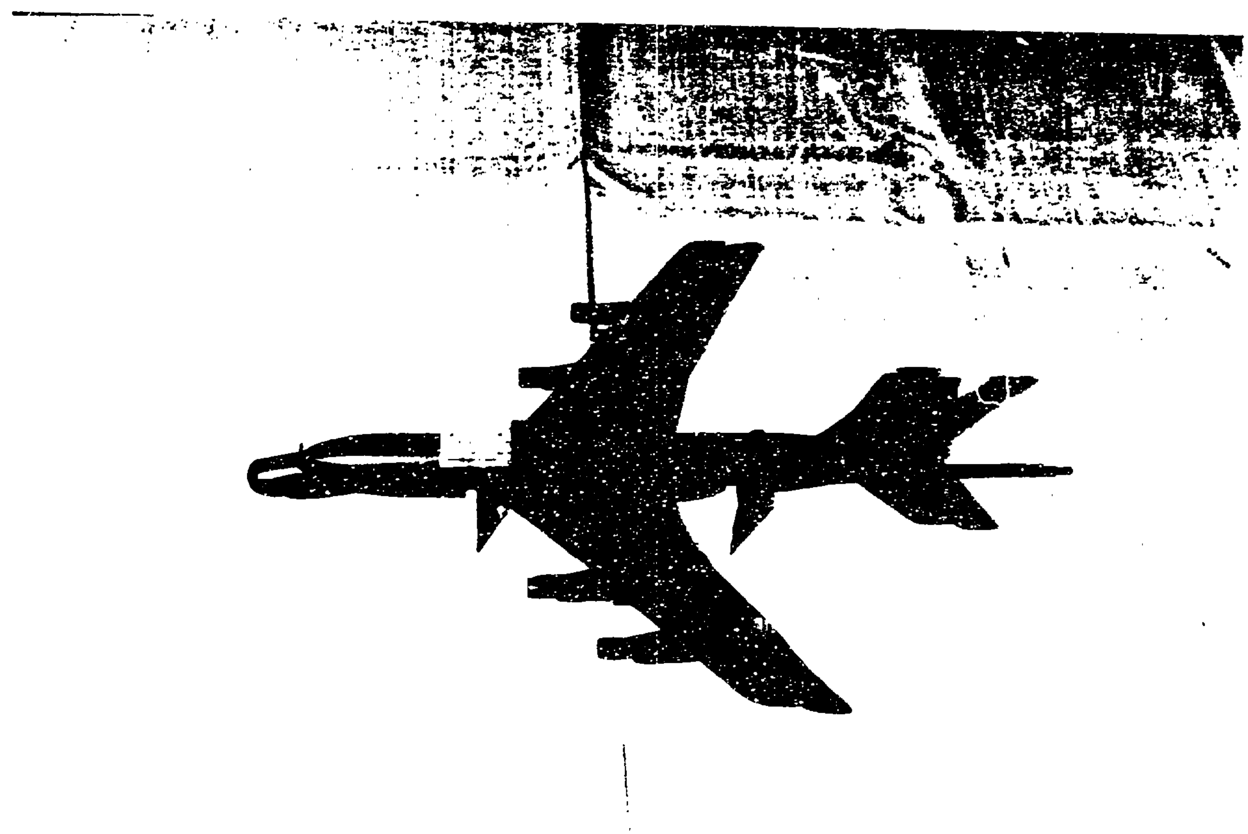

Fig. 2. Model C-18, ARIA Configuration with Calibration Block

five foot, low speed wind tunnel. Procedures were established to evaluate longitudinal and directional stability for C-18 basic configuration (BASIC) and C-18 ARIA. Since the data were gathered in the form of model lift and drag, the lift and drag characteristics of the model were also evaluated.

II. Test Equipment

Wind Tunnel

The AFIT five foot Wind Tunnel was built in 1919 at McCook Field, Dayton OH, and moved to its present location in 1921. It is the open circuit, continuous flow type. The tunnel has a closed test section, five feet in diameter and 18 feet in length, with a contraction ratio of 3.7/1.0. The wooden tunnel, including the intake and diffuser, is contained within a large building which provides a double return passage for the air (see Fig. 5). Tunnel airflow is induced by two 12 foot counterrotating fans, driven by four 400 horsepower, direct current motors, and is capable of providing test section speeds up to 293 feet per second (fps) which corresponds to a Reynolds Number (Re) per foot of 1.876×10^6 under sea level standard day conditions. Total pressure is atmospheric. Static pressure is measured by a manifold containing eight static pressure ports 30 inches from the tunnel entrance and 2.5 feet forward of the test section. Dynamic pressure is measured by a micromanometer connected to static and atmospheric pressure.

This test utilized the three component wire balance, which has front and rear lift wires perpendicular to and drag wires parallel to the longitudinal tunnel axis. The wires are connected to Toledo springless scales which are

equipped with tape printout data recording. The attitude of the model relative to the longitudinal axis of the tunnel was read on a calibrated mechanical analog counter.

Model

The test model (Figs 1 and 2) was constructed from a 1/100 scale VC-137, plastic, Nitto vacuform hobby kit. The VC-137 is essentially a Boeing 707-320B which has no significant external differences from the C-18. The hobby kit was extensively modified in the AFIT model construction shop for wind tunnel testing. The hollow body was filled with epoxy and brass wing stiffeners were installed in the inboard wing section. The rudder was free to move and could be fixed in five degree increments from zero to 25 degrees right (-) or left (+). The horizontal stabilizer was also free to move and could be pinned at seven or six degrees leading edge up (positive incidence) and at two degree increments from six degrees to 10 degrees leading edge down (negative incidence). The model ARIA radome was manufactured in the model construction shop and was designed for easy installation and removal. The rear lift wire attach point was mounted on a sting to prevent interference between the empennage and the rear lift wire. A removable calibration block was fitted to the top of the model. The top and left side of the block were machined parallel to the longitudinal axis of the model.

Model/Tunnel Setup

Prior to installing the model in the tunnel, the model was precisely measured to determine the relative location of the wire balance attach points (see Figs 8 and 9). From these measurements, the angle of the balance relative to the tunnel longitudinal axis was determined. This information was used to position the rear lift scale to insure that the rear lift wire remained perpendicular to the drag wire as the model was pitched. This was accomplished for both the longitudinal and directional testing setup.

Due to the small scale model, it was necessary to mount the front lift wire attachment trunions 10 inches apart. The drag wires were, therefore, reset to a 10 inch spread to keep them parallel to the longitudinal axis of the tunnel.

Once the model was mounted in the tunnel, the angle of attack counter was calibrated in terms of the angle between the model fuselage axis and the longitudinal tunnel axis. Using an inclinometer, positioned on the calibration block, mechanical counter readings were determined for each geometric angle of attack/sideslip. Counter readings were always approached in the positive (nose up) direction to minimize inaccuracy from backlash in the mechanical gear system which drives the counter.

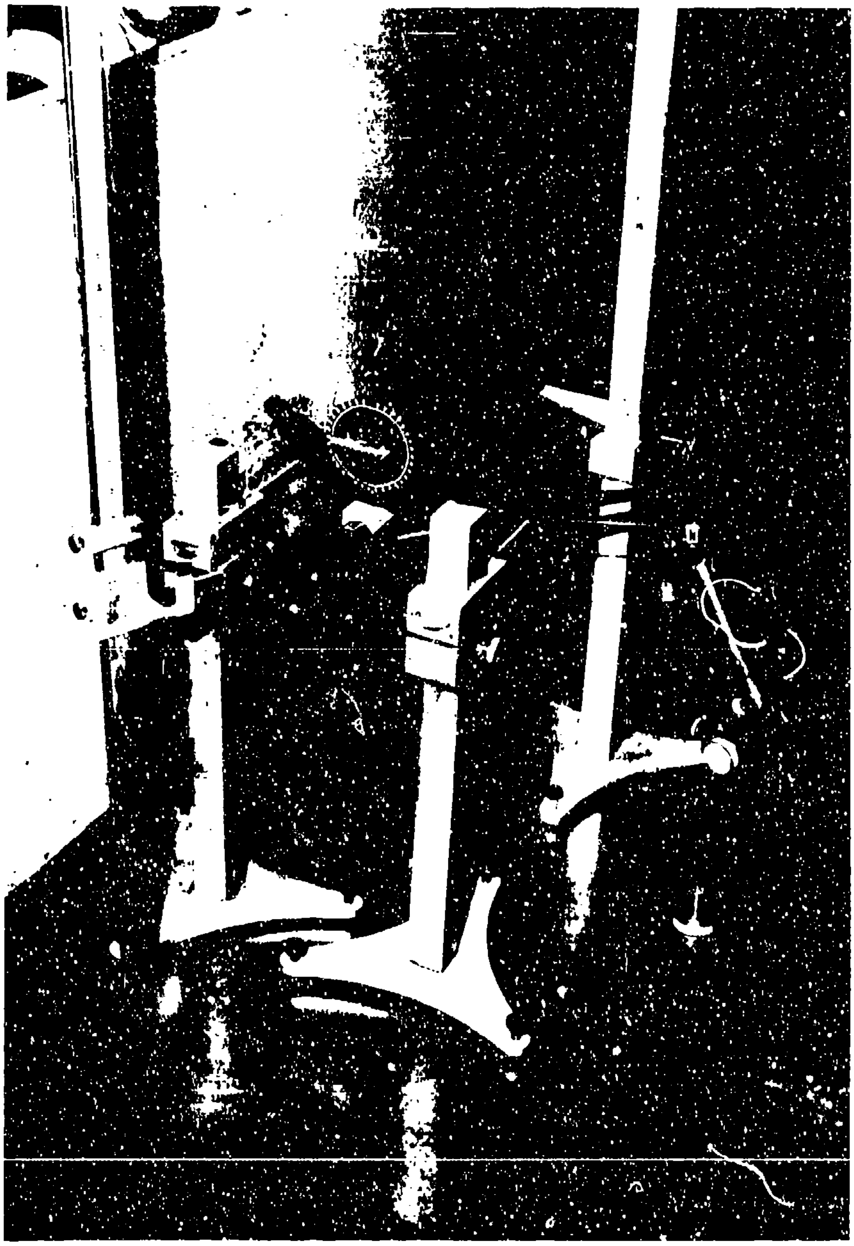

Fig. 3. Model Measurement Setup

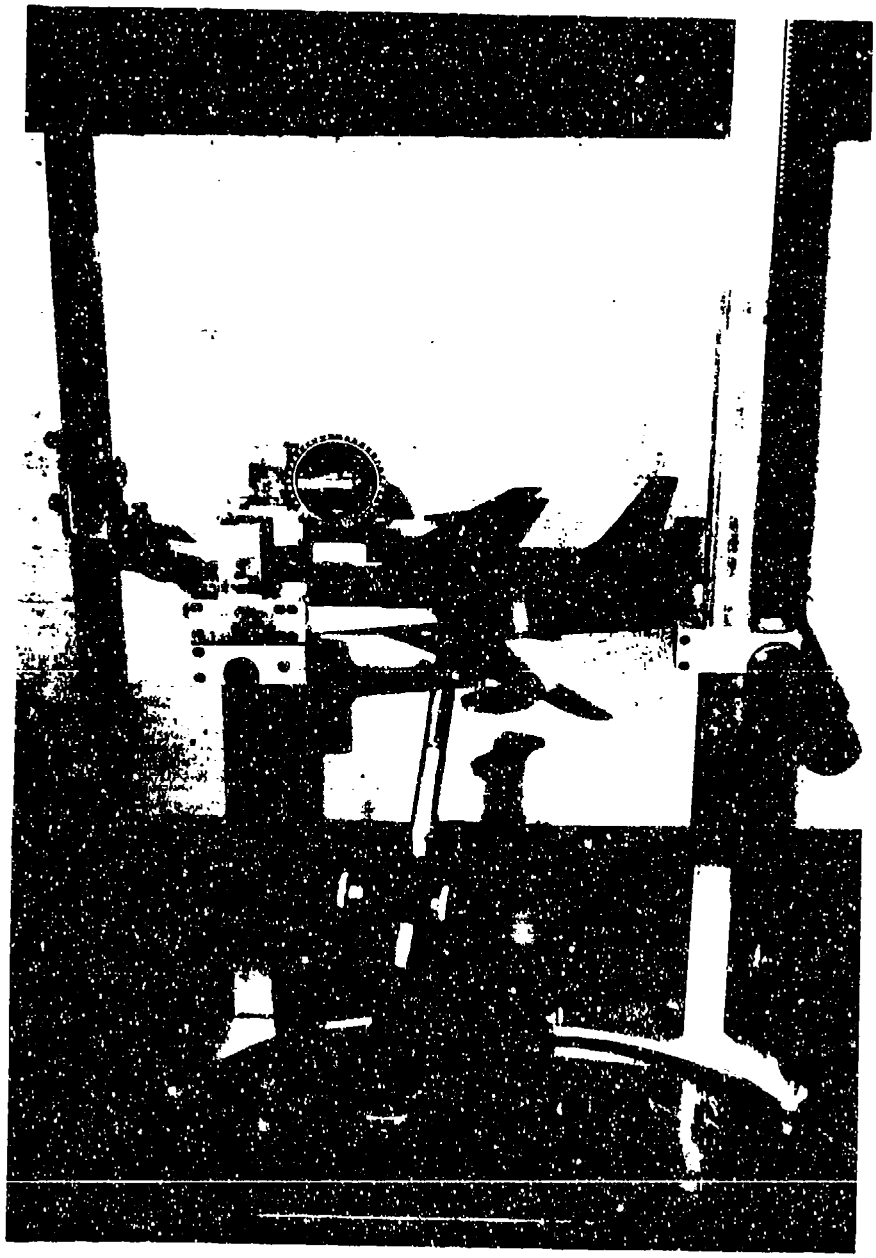

Fig. 4. Model Measurement Setup

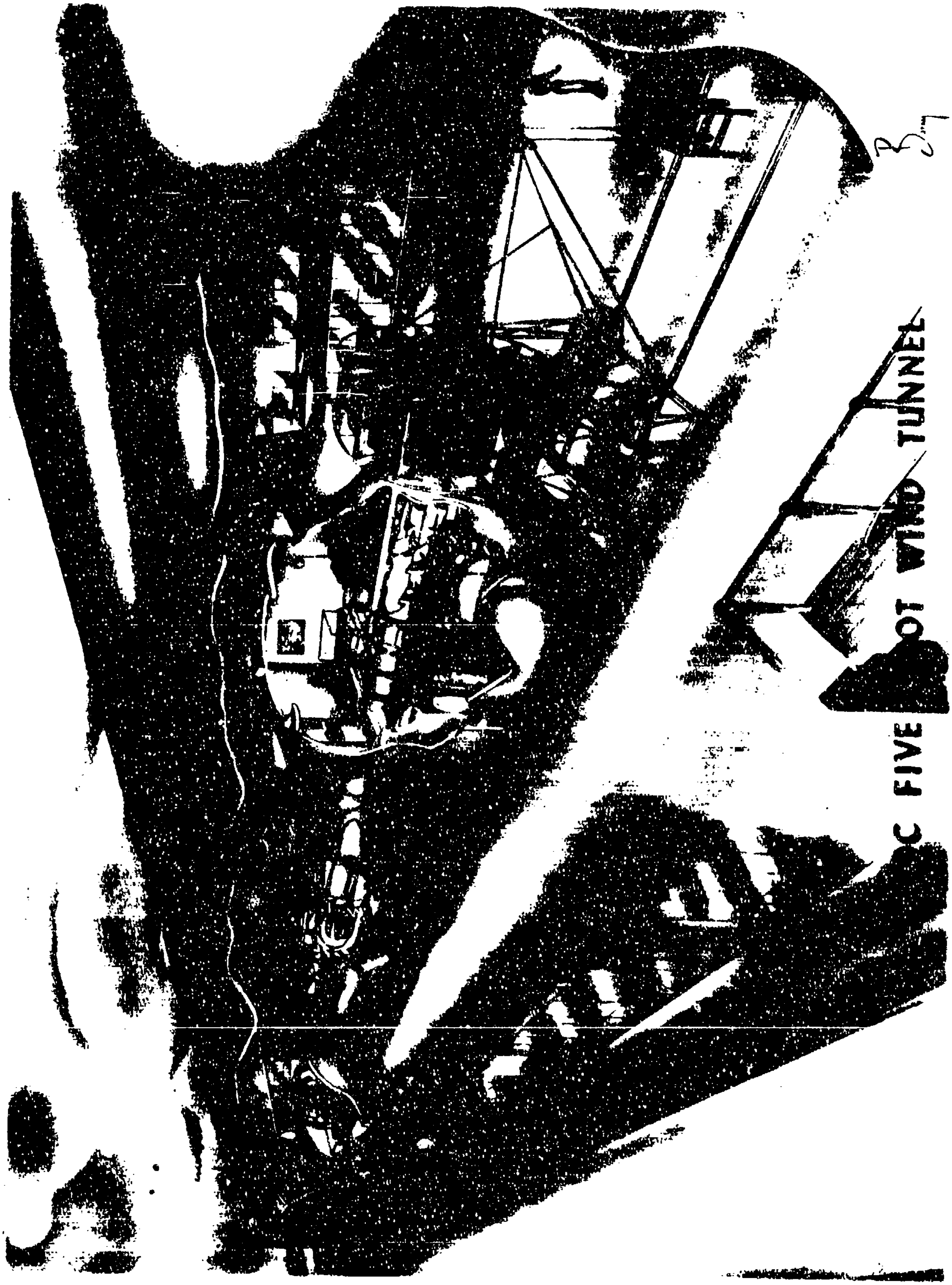

Fig. 5. AFIT Five Foot Wind Tunnel

III. Static Stability Theory

Longitudinal Static Stability Theory

For an aircraft to have static longitudinal stability, pitching moment coefficient (C_M) must decrease as angle of attack (α) increases and increase as α decreases. This assumes a positive nose up moment. Thus, for static stability, $dC_M/d\alpha$ (C_{M_α}) must be negative. In general the wing and fuselage produce a destabilizing moment (C_{M_α} positive) which is offset by the horizontal stabilizer to keep C_{M_α} negative for the combined airplane. From the development in Chapter Six, Reference 3, ignoring the influence of the propulsion system,

$$C_{M_\alpha} = C_{L_\alpha} (h - h_n) \tag{1}$$

where,

$$h_n = h_{nwb} - 1/C_{L_\alpha} (dC_{Macwb}/d\alpha - V_h \, dC_{Ltail}/d\alpha) \tag{2}$$

and

$$K_n = (h_n - h) \tag{3}$$

K_n is the static margin which must be positive for a statically stable airplane. For low speed wind tunnel applications, in the absence of Mach effects where $C_T = 0$ and dynamic pressure is held constant, it is possible to treat C_M as a unique function of C_L. Thus,

$$dC_M/dC_L = h - h_n \tag{4}$$

Therefore, dC_M/dC_L must be negative for a statically stable airplane.

Now, the addition of the ARIA radome to the C-18 aircraft increases the fuselage area and length well forward of the aircraft center of gravity. Thus, any normal aerodynamic force generated by the ARIA radome will act through a greater lever arm and probably with increased magnitude relative to the normal force generated by the BASIC airplane nose section. This should result in a forward shift of h_{nwb} and an increase in $dC_{Macwb}/d\alpha$. Thus, from equation 2, holding tail volume and tail lift slope constant, the probable result of adding the ARIA radome should be a forward shift of the neutral point, reducing the static margin and increasing dC_M/dC_L. Therefore, the ARIA radome should reduce the longitudinal static stability of the C-18 aircraft.

Static Directional Stability

For static directional stability, yawing moment (C_N) must increase as sideslip angle (β) increases or $dC_N/d\beta$ must be positive. This assumes yawing moment positive to the right and positive sideslip angle corresponding to nose left of the flight path. As with a normal force, any sideforce generated by the ARIA radome will act through a greater lever arm forward of the CG and probably with increased magnitude relative to sideforce generated by the BASIC airplane nose section. Thus the ARIA radome should be directionally

destabilizing and result in a decrease in $dC_N/d\beta$ and an increase in $dC_Y/d\beta$ relative to the BASIC C-18 aircraft.

IV. General Test and Data Analysis Procedures

Testing was accomplished with the model in ARIA configuration. Individual runs were accomplished at 60 pounds per square foot (PSF) dynamic pressure at discrete values of stabilizer or rudder angle. Prior to data recording, model center of rotation was reset to the wind off location and the wires were mechanically vibrated to reduce the effects of hysteresis in the wire/pulley system. At each angle of attack/sideslip, eight readings were recorded wind on and three wind off on each of the front lift, rear lift and drag scales. Multiple readings were taken and averaged to reduce data scatter. Wind off static values were recorded at least every other run throughout the angle of attack/sideslip range when runs were made close together. Static readings were taken before and after individual runs when a significant time lapse existed between them. The data reduction outline is presented in Appendix A and accuracy discussion in Appendix B.

In order to extract stability derivatives and evaluate trimmed lift and drag, it was necessary to fit the data to a mathematically representable curve. This was done using the technique of least squares. Thus, curves plotted through data represent a least square fit and have the polynomial representation listed in Appendix E.

V. Longitudinal Testing

Longitudinal Test Procedure

Longitudinal testing was accomplished over a geometric angle of attack range (α_g) from -4 degrees to 18 degrees, with stabilizer angles from 10 degrees leading edge down (-10 degrees) to 6 degrees leading edge up.

Longitudinal test conditions for BASIC and ARIA configurations are specified in Appendix C. For each stabilizer angle, wind tunnel speed was stabilized and data were collected in two degree α increments from -4 degrees to 10 degrees, and in one degree increments from 10 degrees to 18 degrees. Data were first collected at zero degrees α_g, then collected from -4 degrees to 18 degrees α_g by constantly increasing α. Data collection was repeated at 16, 12, 8, 4, and 0 degrees α_g as α was decreased. Stabilizer angles -2 degrees and 6 degrees were evaluated for the BASIC configuration to demonstrate data consistency/measurement system sensitivity and were not evaluated in the ARIA configuration.

Longitudinal Data Analysis

Trim points were evaluated by taking the angle of attack or C_L corresponding to zero C_M for each stabilizer angle. Thus, the trimmed C_L was determined directly from the C_M vs C_L plot or indirectly from the trimmed α crossed referenced to the C_L vs α plot. Trimmed C_D was determined in a similar

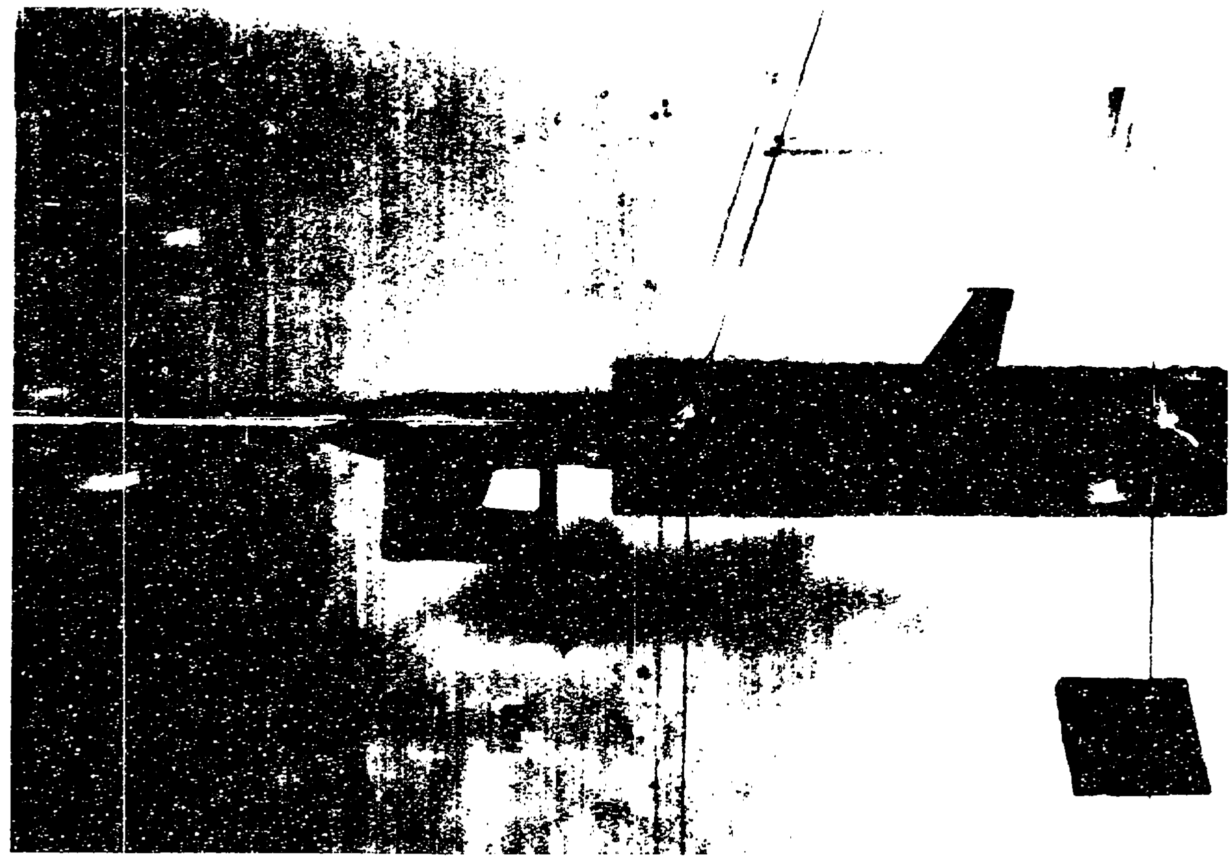

Fig. 6. Longitudinal Tunnel Mount, BASIC Configuration

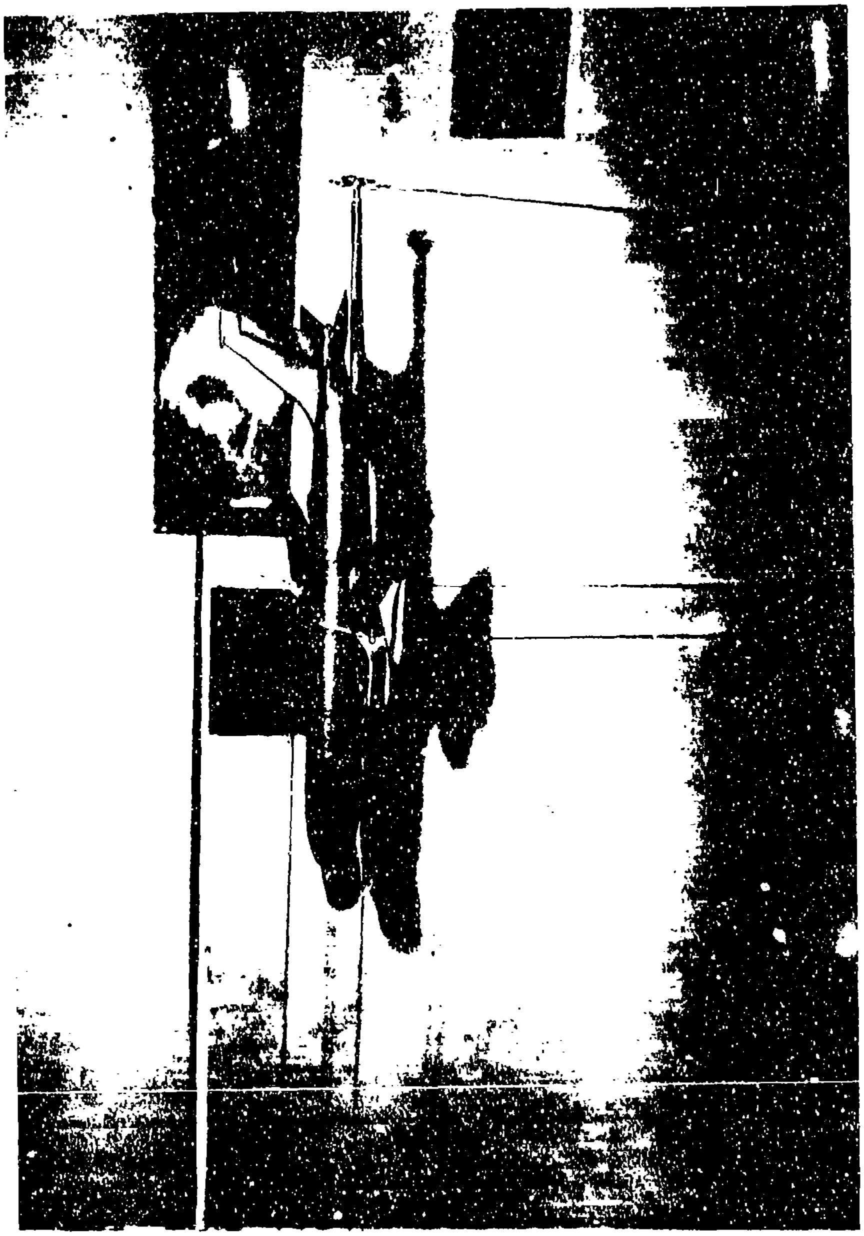

Fig. 7. Longitudinal Tunnel Mount, ARIA Configuration

manner. Figures D3 through D8, which present dC_M/dC_L, vs C_L were generated by taking the derivative of C_M vs C_L and represent the continuous slope of the second order curves in the C_M vs C_L plot.

Longitudinal Test Results

Longitudinal test results are presented in Figs 22-27 and D1-D25.

Static Stability

The model demonstrated positive longitudinal static stability for BASIC and ARIA configuration at all test conditions prior to stall. The change in static longitudinal stability between ARIA and BASIC configurations ($\Delta dC_M/dC_L$) was small, particularly in the mid lift coefficient range. With reference to Fig. 8, it can be seen that for, trimmed conditions, ARIA configuration was slightly less stable than BASIC configuration, with the largest difference occurring at the extreme lift coefficient values. $\Delta dC_M/dC_L$ was on the order of .03 at -.2 C_L trim and .8 C_{Lt} and on the order of .012 to .001 from .2 to .5 C_{Lt}. The small $\Delta dC_M/dC_L$ in the mid C_{Lt} range indicated that the net destabilizing effect generated by the ARIA radome was very small. dC_M/dC_L for the two configurations is directly compared for each discrete stabilizer angle in Figs D3 through D8. In general, the plots show regions where the ARIA configuration is more and less stable than the BASIC configuration. The ARIA

configuration was relatively more stable at high lift coefficients and positive stabilizer angles and at low lift coefficients and negative stabilizer angles. This trend indicates that there may have been interference due to the ARIA radome on the horizontal stabilizer increasing stabilizer effectiveness and offsetting the anticipated destabilizing effect of the ARIA radome. However, with the exception of -2 degrees stabilizer angle, the regions where the ARIA configuration was relatively more stable are far removed from the trim point and do not represent areas of practical aircraft operation or significance.

Lift

For constant α values below approximately 12 degrees, total lift for ARIA was less than total lift BASIC. This conclusion is based on Fig. 25, C_L vs α trim, which was extracted from Figs D1, D2, D9, and D10. Conversely, a higher angle of attack was required for ARIA than BASIC to achieve the same C_L. Apparently the higher α was required to increase wing lift to offset a downloaded ARIA radome. Figure 11 shows that C_L vs α trim ARIA crosses C_L vs α trim BASIC in the vicinity of 12 degrees α. The gradual decrease in ΔC_L indicates a gradually decreasing download on the ARIA radome to approximately 12 degrees α which represents the zero lift angle of attack for the ARIA radome. This apparent download, decreasing with increasing α, forward of the aircraft center

of gravity (CG) should produce a destabilizing nose down moment, gradually decreasing as α increases to 12 degrees. Data displayed in Fig. 8 is consistent with this expectation. $\Delta dC_M/dC_L$ gradually decreased with increasing C_L. The increase in $\Delta dC_M/dC_L$ at the C_L corresponding to 12 degrees indicates that the ARIA radome was transitioning to an uploaded condition with a resulting destabilizing nose up moment. Figure 12, stabilizer angle vs C_L trim, shows that a more negative stabilizer angle was required to trim a given C_L for ARIA than BASIC which is also consistent with a downloaded radome.

Drag

The change in drag due to the addition of the ARIA radome appeared to be less than drag measurement system accuracy and could not be quantified. Plots of C_D vs C_L and C_D vs C_L^2 presented in Figs D13 through D24 for different stabilizer settings show inconsistent drag differences between BASIC and ARIA configurations. Based on Reference 1, a drag increase due to the ARIA radome on the order of 6% was anticipated. Thus, based on a model drag of .6 pounds (C_D of .033), a Δ drag on the order of .036 pounds (ΔC_d on the order of .002) was expected. Based on theory, this difference should be independent of stabilizer setting and remain essentially constant over the linear range of the C_D vs C_L^2 drag polar. Test results were inconsistent with this theory.

This inconsistency was attributed to low model drag

below .5 C_L. This apparently resulted in data inaccuracies greater than the drag change due to the ARIA radome and greater than the reading accuracy of the drag scale (.01 pound). Data scatter was significantly reduced at high C_L where model drag was on the order of four pounds. The significant scatter in the drag data at low force levels can reasonably be attributed to friction within the long wire and pulley system connecting the model with the drag scale. In addition, a small variation in the longitudinal position of the center of rotation would produce a large percentage change in low level drag.

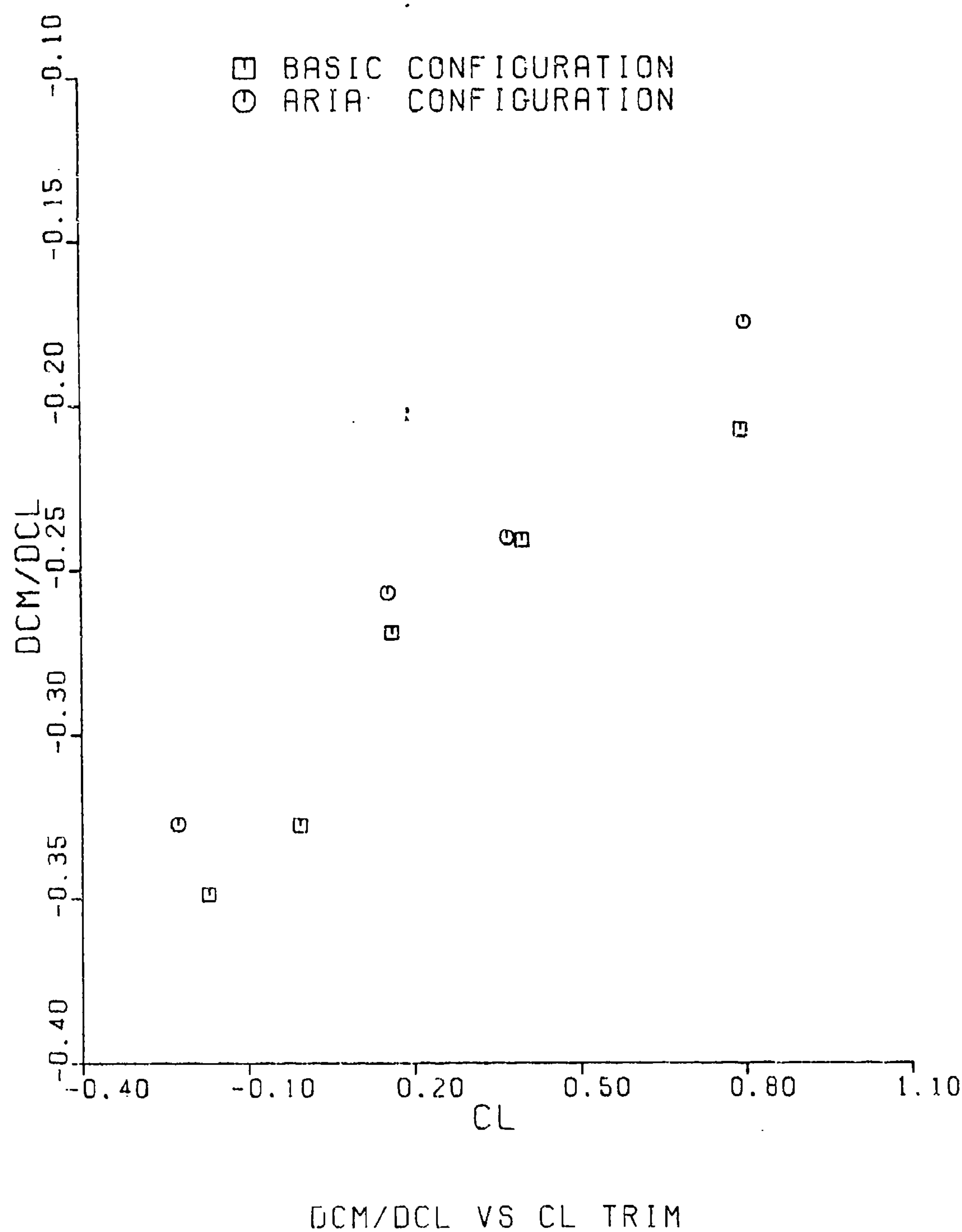

Fig. 8. $\partial C_M/\partial C_L$ vs C_L Trim

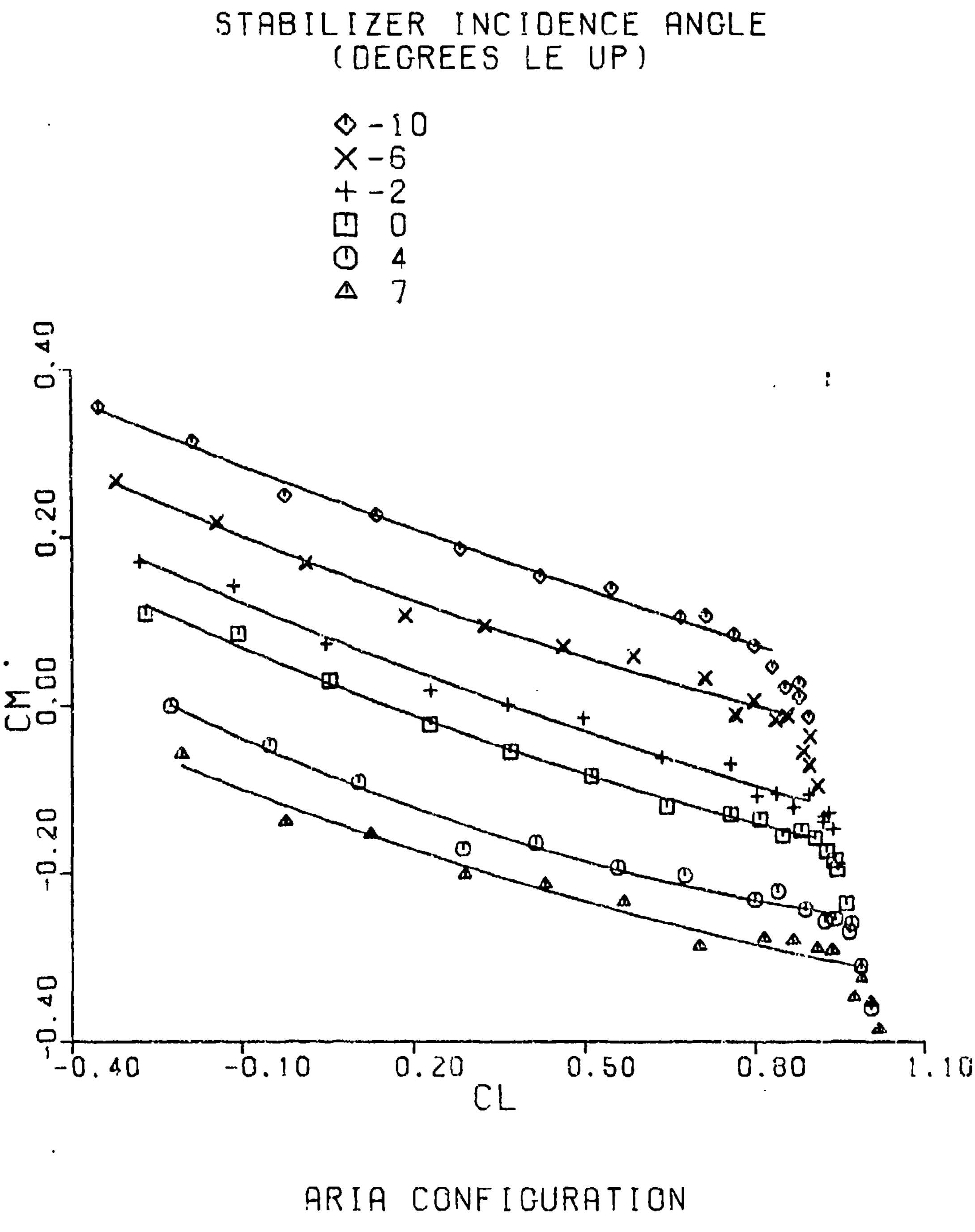

Fig. 9. C_M vs C_L, ARIA Configuration
(C_M about 25% MAC)

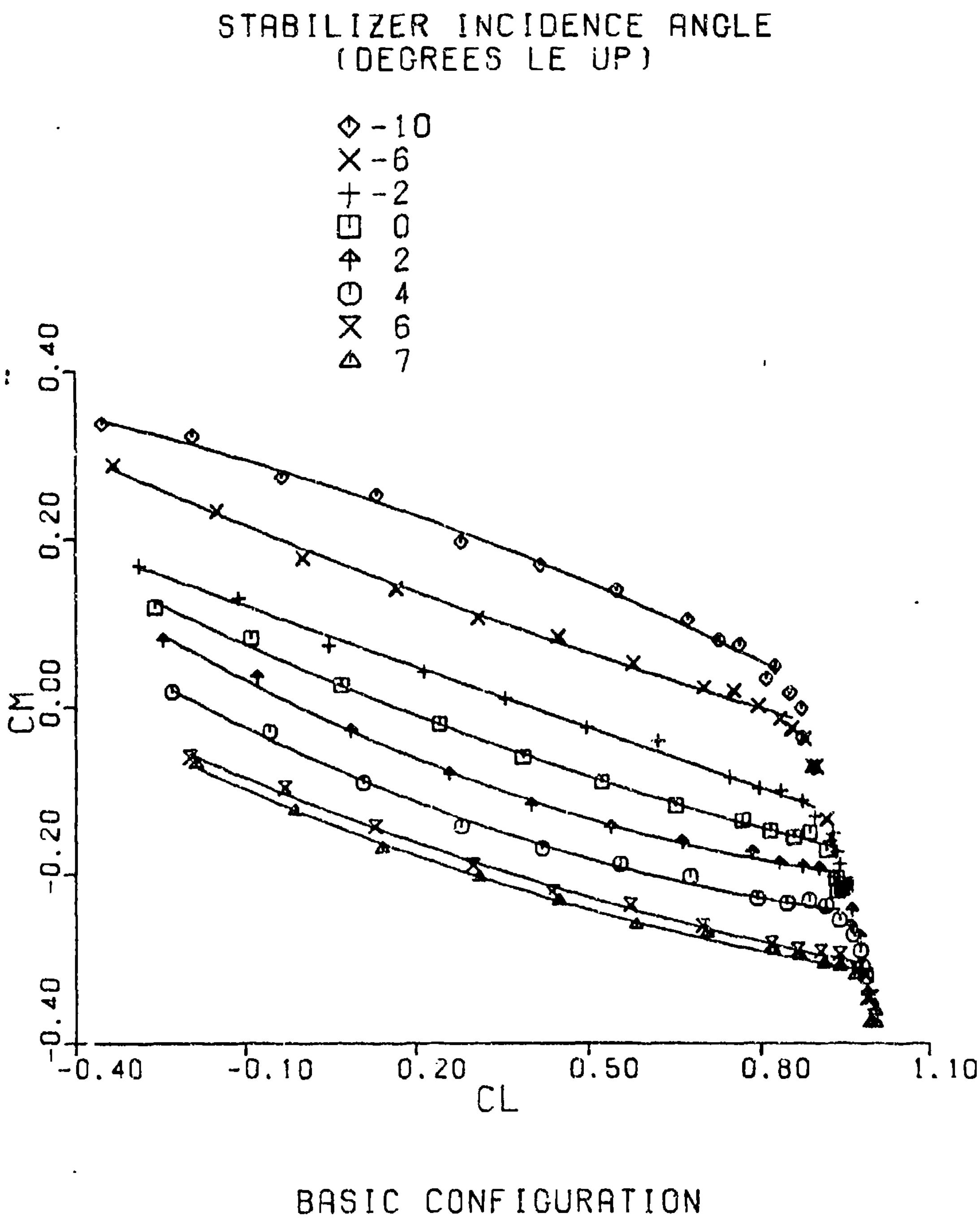

Fig. 10. C_M vs C_L, BASIC Configuration
(C_M about 25% MAC)

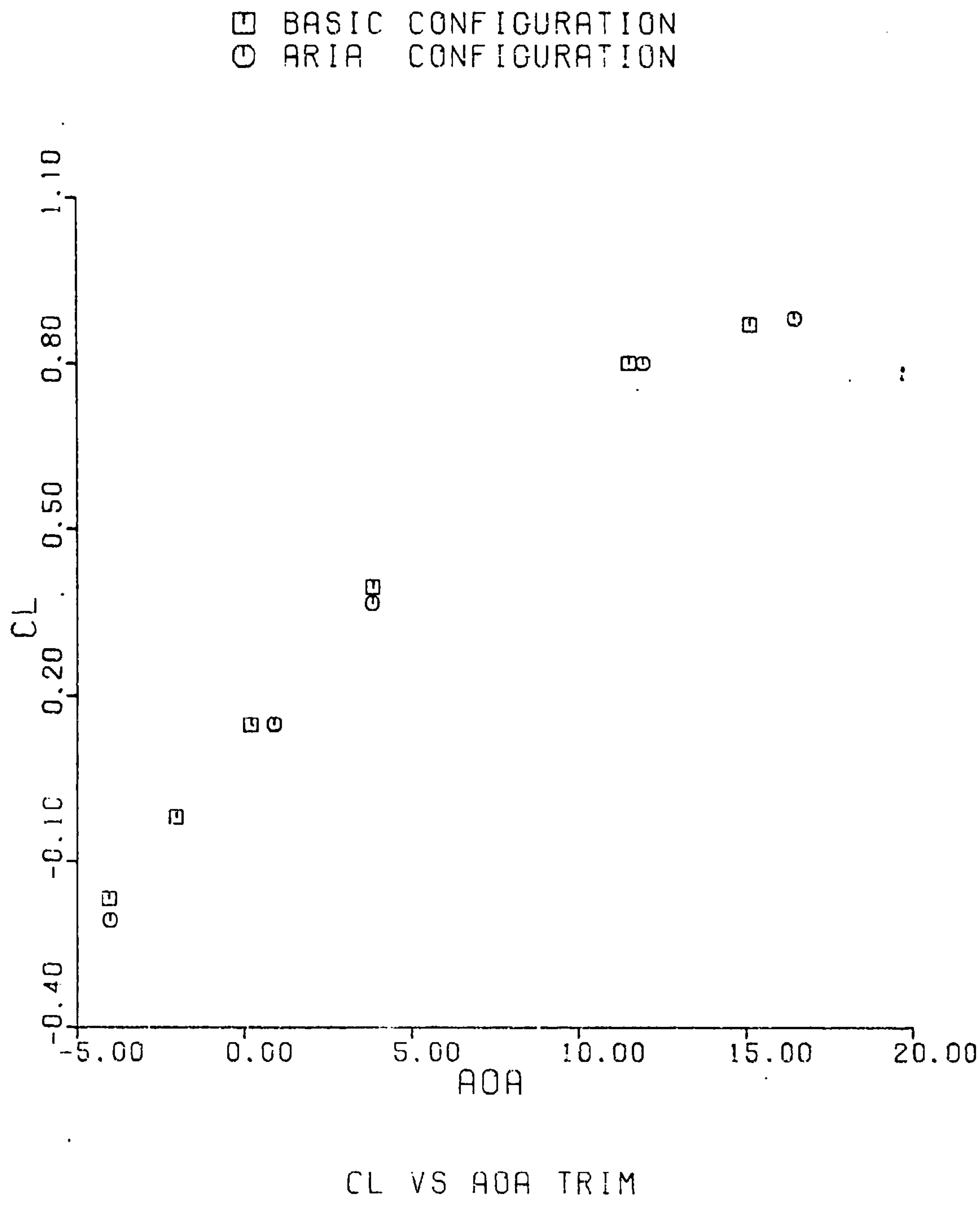

Fig. 11. C_L vs α, Trim

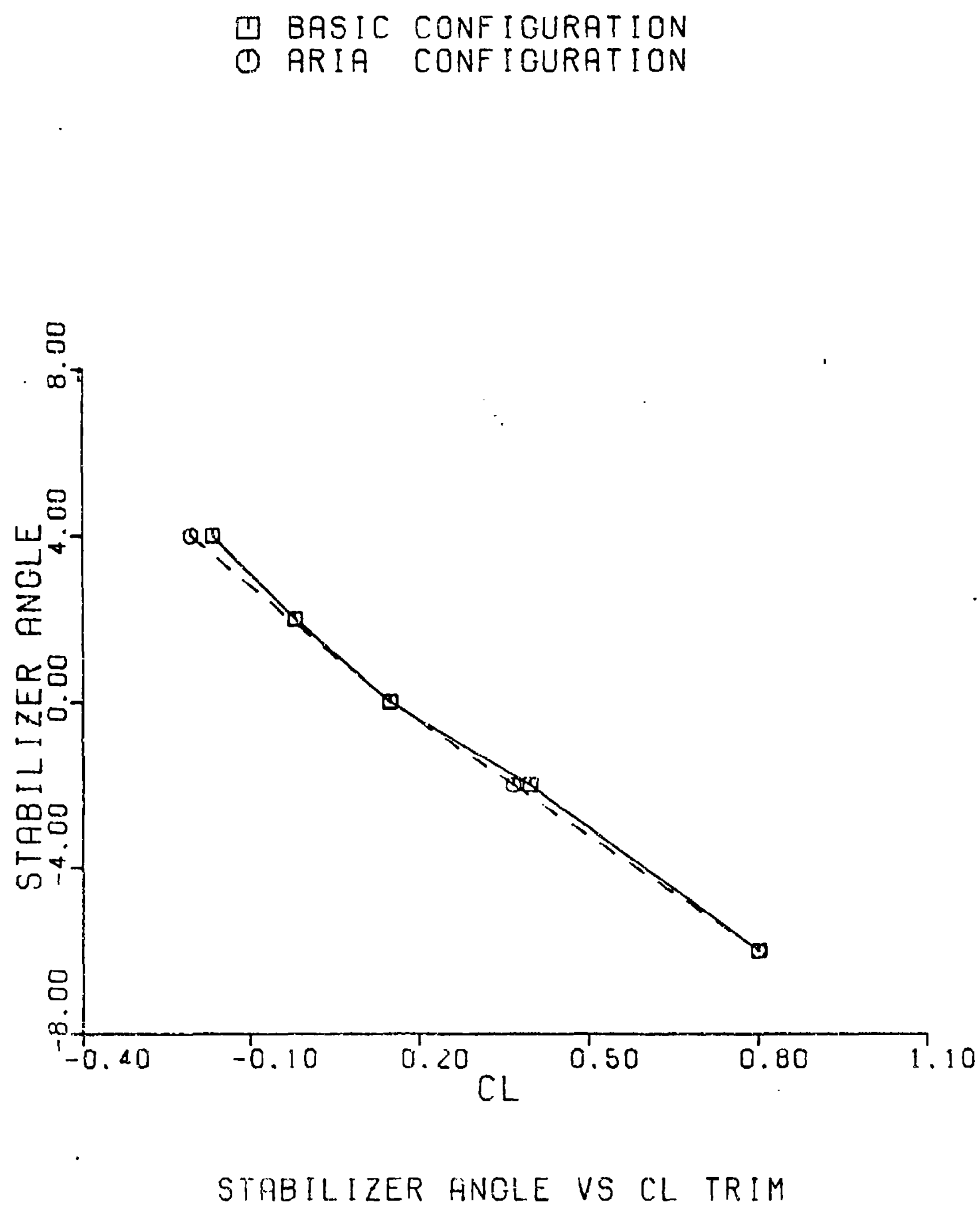

Fig. 12. Stabilizer Angle vs C_L Trim

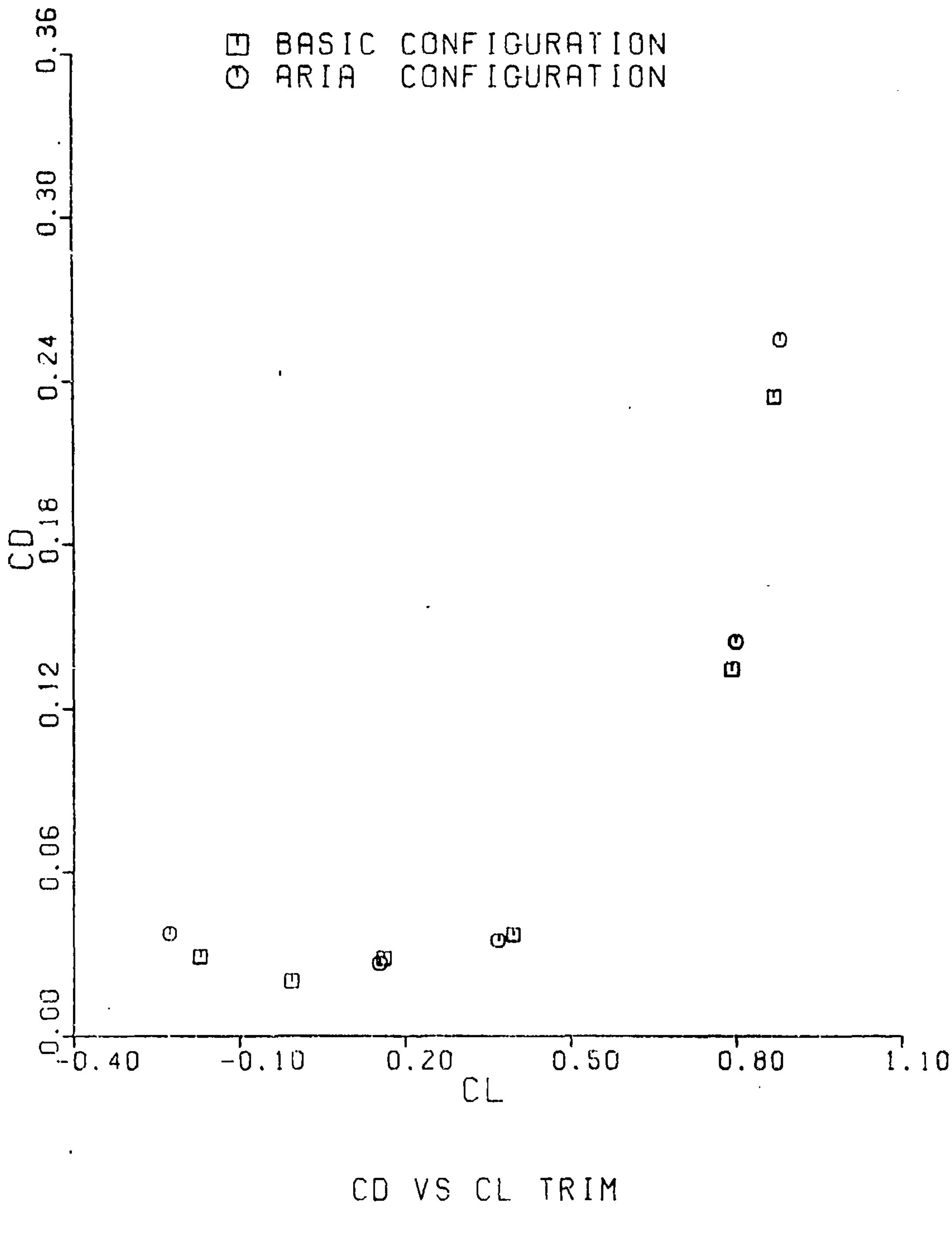

Fig. 13. C_D vs C_L Trim

VI. Directional Testing

Directional Test Procedure

With the model mounted for longitudinal testing, it was not possible to measure sideforce or yawing moment. Therefore, in order to accomplish directional testing, it was necessary to extensively modify the model/tunnel mounting arrangement using a tunnel setup developed by M. Skujins and described in References 2 and 7.

Model directional test mounting is depicted in Figs 14, 15, and 16. A bar was installed in the model, passing through the fuselage center line at 25% MAC perpendicular to the fuselage longitudinal axis. The ends of the bar were connected to the front lift wires. In this setup, the front and rear lift scales measured sideforce and the drag scale still measured drag as the model was pivoted about the axis of the bar. The model was fixed at zero angle of attack and the stabilizer was fixed at zero degrees. Lift, which moved the model off centerline, was countered with a five pound weight mounted outside the tunnel and connected to the model through the wire/pully arrangement shown in Fig. 14. Wind on and wind off static readings were recorded with the weight on and off respectively. With the model on centerline, the resultant force due to the weight was perpendicular to the lift and drag wires so that wind on lift and drag readings

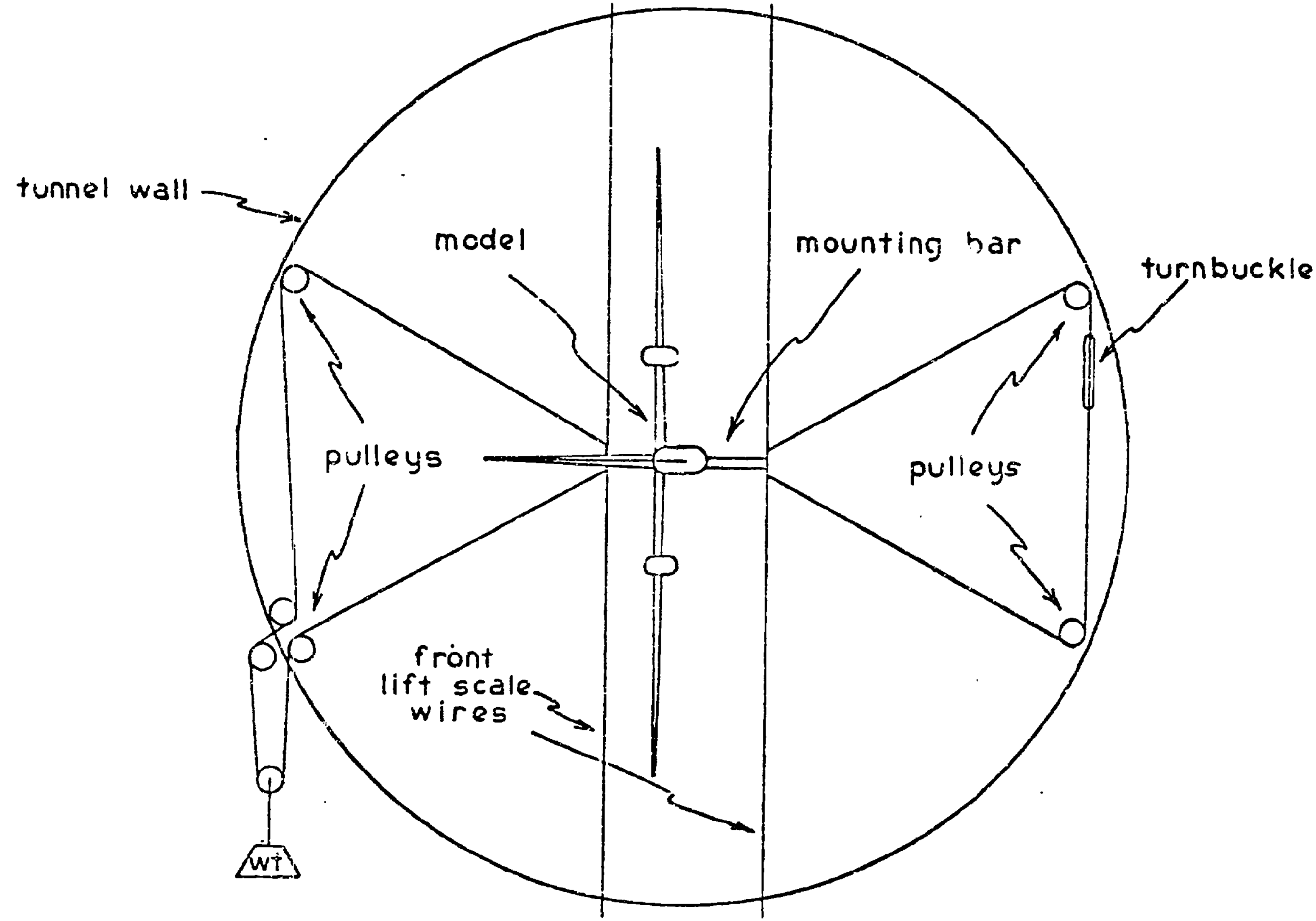

Fig. 14. Sideslip Tunnel Mount
(Extracted from Ref 2)

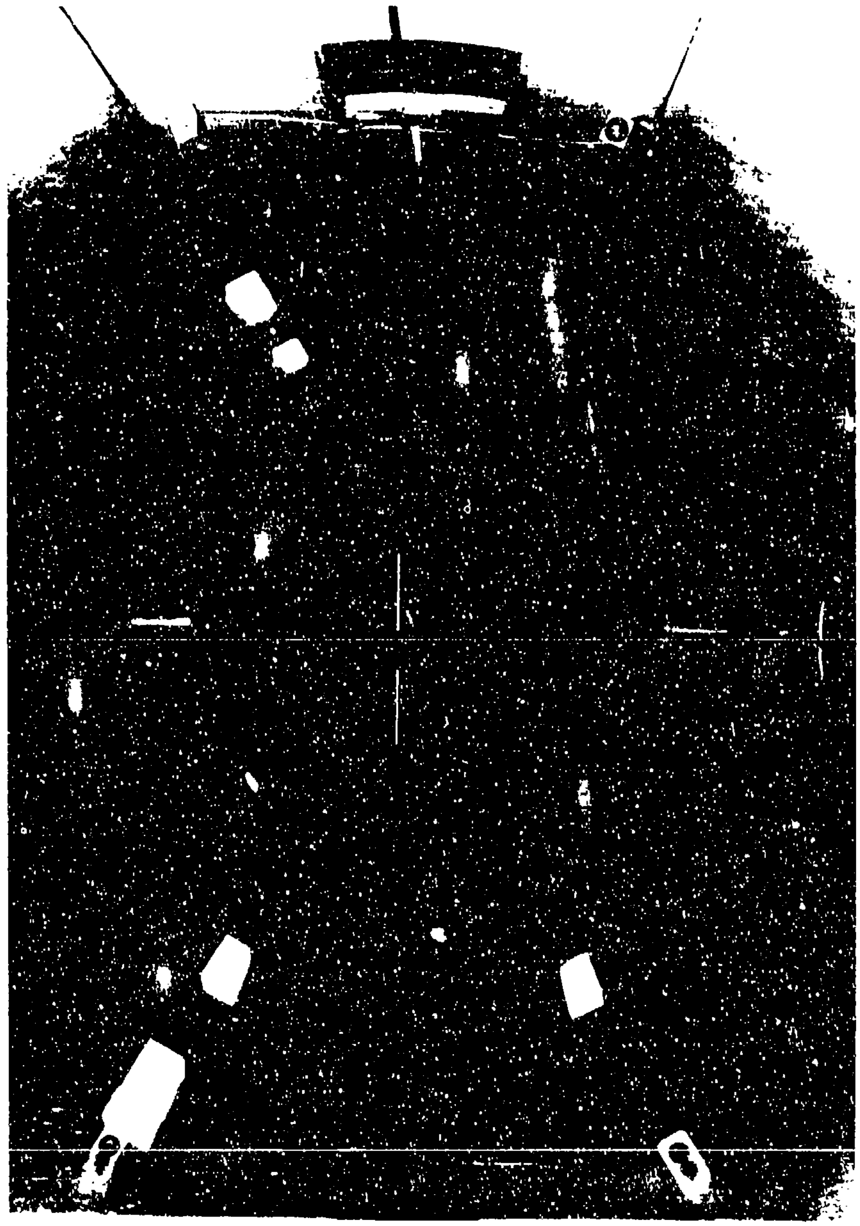

Fig. 15. Sideslip Tunnel Mount

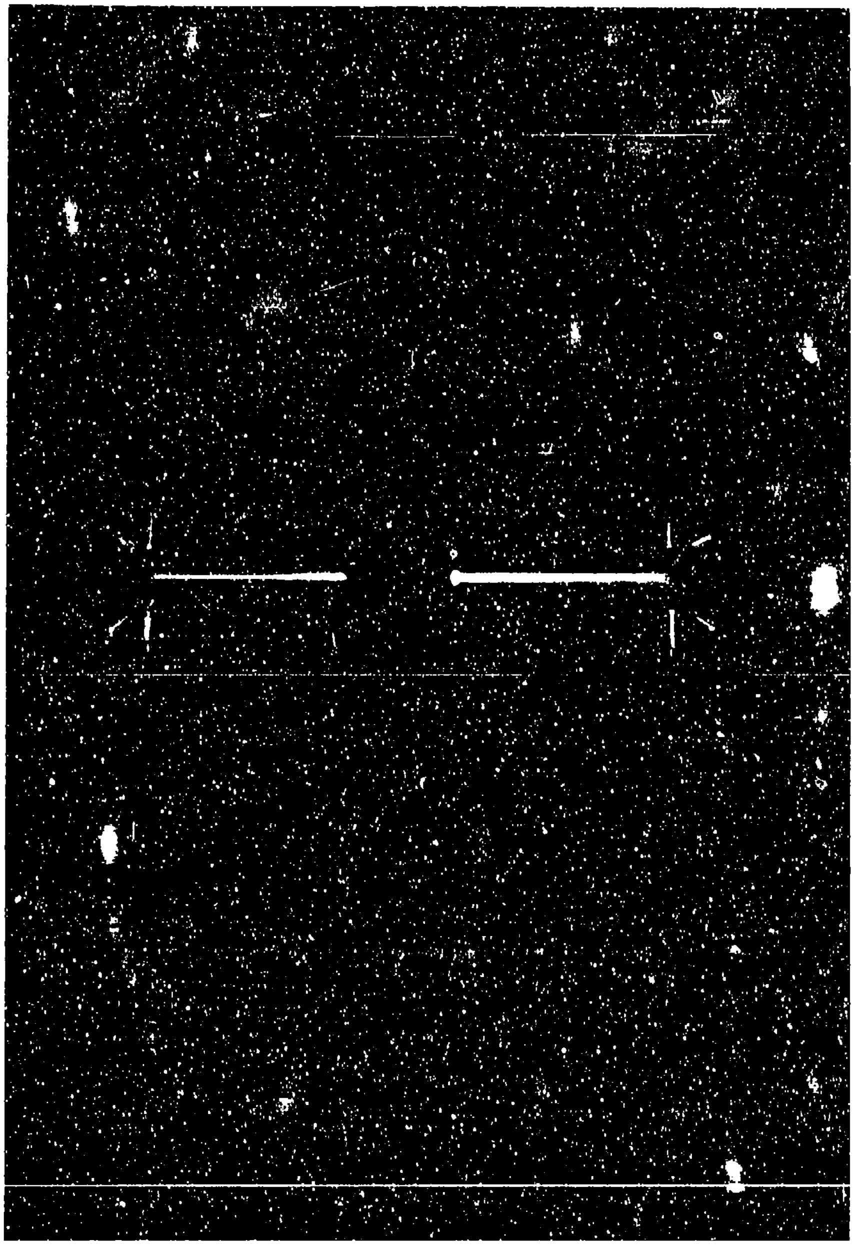

Fig. 16. Sideslip Tunnel Mount

required no correction due to the weight. Conversely, the weight was removed for wind off data recording to prevent a component of the five pound weight from altering the static readings.

Directional test conditions are noted in Appendix C. Following tunnel stabilization, data were collected between -6 degrees (nose down/right) and +6 degrees (nose up/left) geometric sideslip angle β_g. Data were first collected at zero degrees β_g, then collected from -6 degrees to +6 degrees in two degree increments by constantly increasing sideslip angle. Data collection was then repeated at 4, -4 and 0 degrees.

Directional Data Analysis

Trim points were evaluated from the C_N vs β plot for rudder angles with zero yawing moment in the test sideslip range. Plots of $dC_N/d\beta$ and $dC_Y/d\beta$ vs β (Figs D32, D38, and D41-D47) were generated by differentiating C_N vs β and C_Y vs β and represent the continuous slope of the second order curves fitted through the data.

Directional Test Results

Directional test results are presented in Figs 17 and 18 and D25-D47.

The model displayed positive directional static stability for BASIC and ARIA configurations at all rudder deflections

throughout the test sideslip range. Data displayed in Figs D-32 and D-38 show that $dC_N/d\beta$ ARIA was not significantly different than $dC_N/d\beta$ BASIC. In addition, data displayed in Figs D-41 through D-47 show that $dC_Y/d\beta$ ARIA was not significantly different than $dC_Y/d\beta$ BASIC. Since the anticipated decrease in $dC_N/d\beta$ and increase in $dC_Y/d\beta$ was not observed, test results indicated that the model ARIA radome generated very little sideforce, even with sideslip angles up to the test maximum of -6.25 degrees.

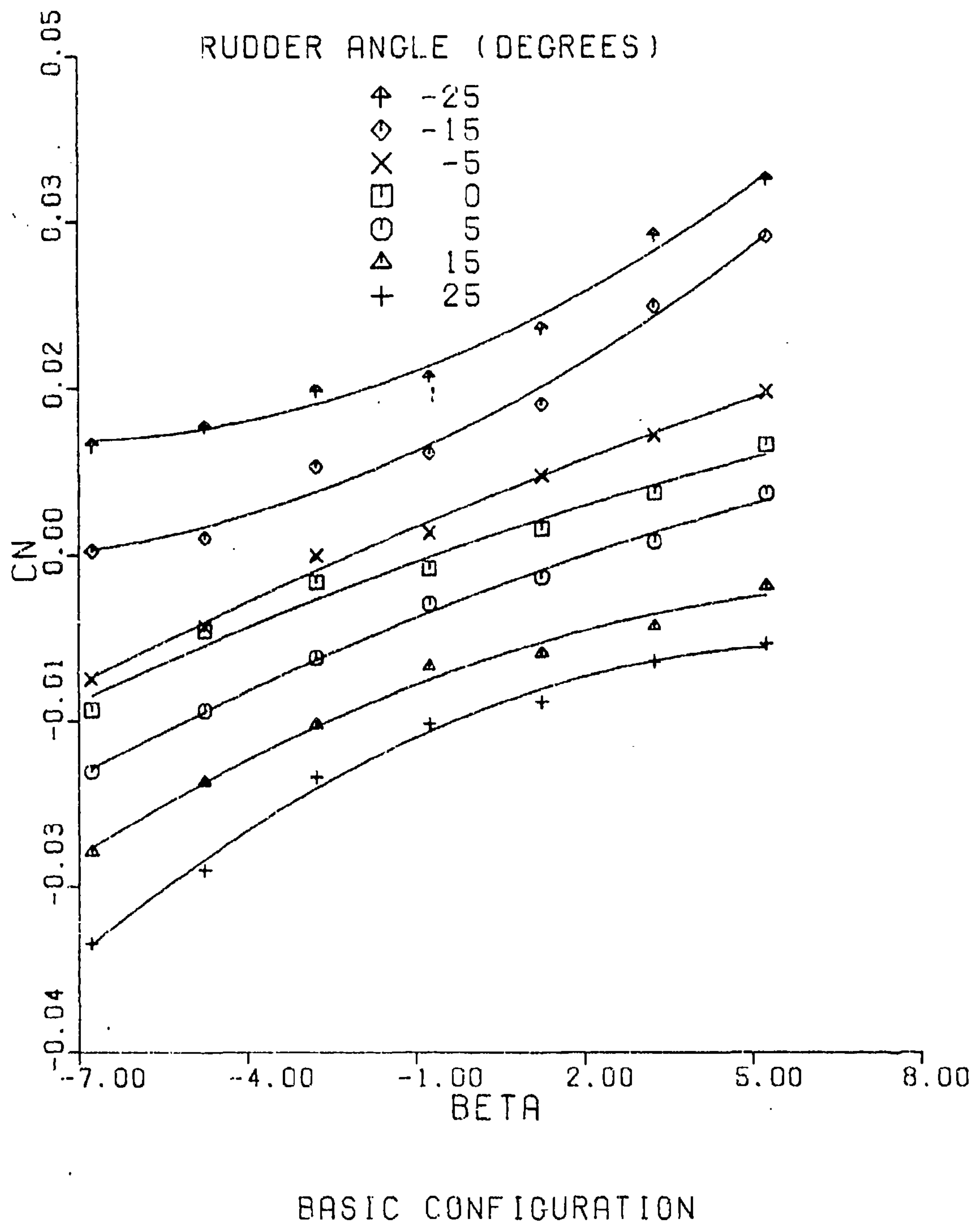

Fig. 17. C_N vs β, BASIC Configuration (C_N about 25% MAC)

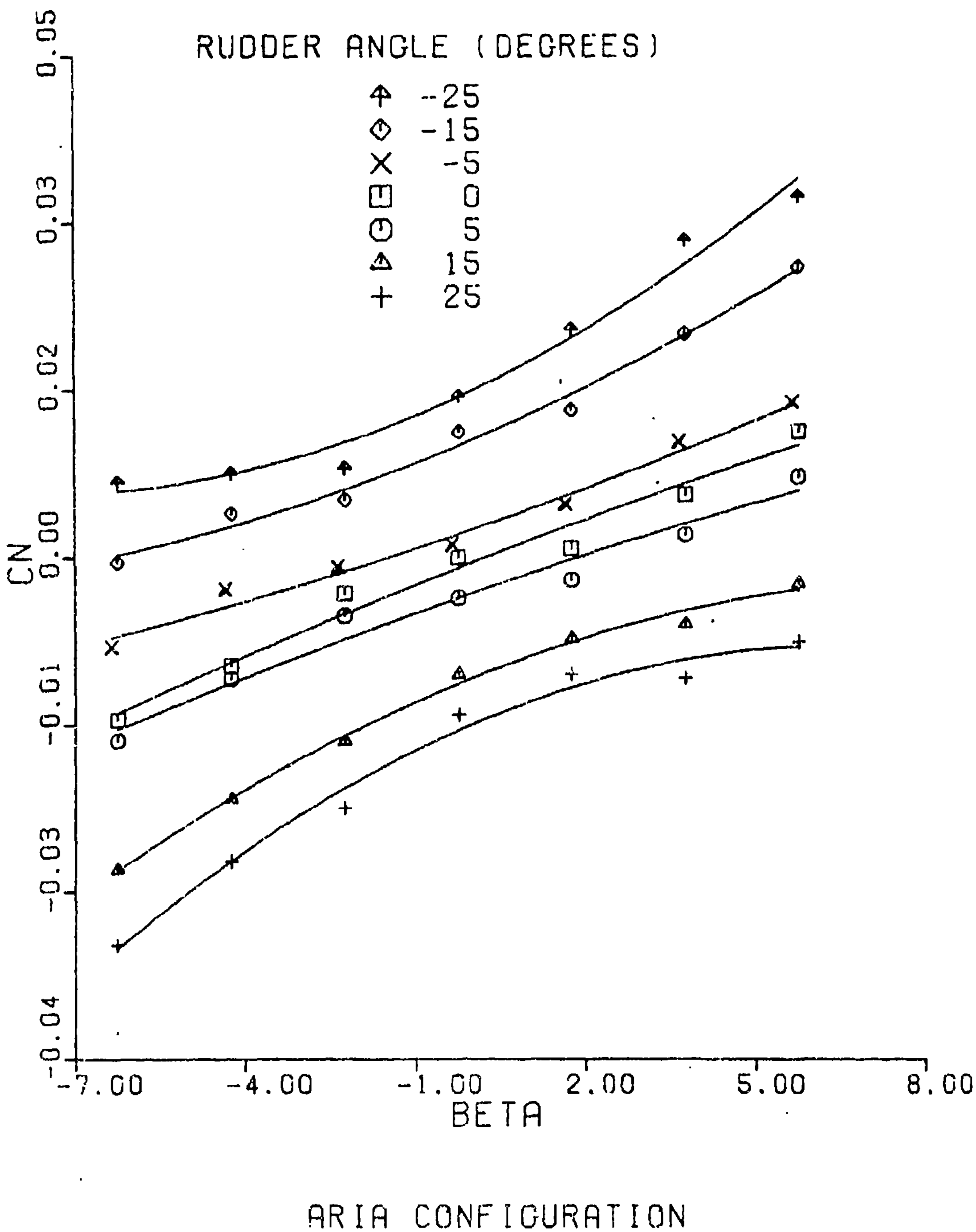

Fig. 18. C_N vs β, ARIA Configuration
(C_N about 25% MAC)

VII. Conclusions and Recommendations

Conclusions

The model demonstrated positive longitudinal static stability for BASIC and ARIA configurations at all stabilizer settings with model angle of attack below stall. As trim, the ARIA configuration was slightly less stable than BASIC. $\Delta dC_M/dC_L$ was on the order of .03 at -.2 C_{Lt} and .8 C_{Lt} and on the order of .012 to .001 from .2 to .5 C_{Lt}.

Below 12 degrees α a higher α was required for ARIA than BASIC to achieve the same C_L. Apparently the higher α was required to increase wing lift to offset a downloaded ARIA radome. C_L vs α plots for ARIA and BASIC crossed near 12 degrees α indicating an uploaded condition for the ARIA radome above 12 degrees α.

The change in drag due to the addition of the ARIA radome was anticipated to be on the order of .036 pounds. This small difference appeared to be less than drag measurement system accuracy, and could not be quantified.

The model displayed positive directional static stability for BASIC and ARIA configuration at test sideslip angles from -6.24 to +5.77 degrees. Directional static stability did not change significantly due to addition of the ARIA radome.

Although the model was relatively small, good moment

and lift results were obtained. However, the drag data in the α range below seven degrees was erratic. This was probably due to the small drag force (on the order of .6 pounds) generated by the model relative to the accuracy of the drag measurement system.

Recommendations

A. To determine drag due to the ARIA radome, a larger model must be used.

B. Data collection should be concentrated at low angle of attack and with stabilizer angles between -6 and +2 degrees.

C. If model size will permit, the variable stabilizer should be designed with one degree pin increments between -6 and +2 degrees.

Recommendations B and C will produce more trim lift, trim drag, and trim moment data. Stabilizer angles between -6 and 2 degrees will provide more trim data at positive lift coefficients below stall.

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APPENDIX A

Data Reduction

The data were reduced on the AFIT Harris 500 computer and plotted using the ASD Cyber computer and subprograms written by CALCOMP Corporation. Wind tunnel boundary corrections were applied following the method of Chapter Six in Reference 6.

Longitudinal data reduction outline is as follows:

a. Correct measured drag for horizontal buoyancy and wire drag.

$$D_u = D_m + \delta D_b - D_{wire}$$

and

$$C_{Du} = D_u/Q_u S$$

b. Compute uncorrected total lift coefficient (C_{Lu}).

$$L_u = R_L + F_L$$

$$C_{Lu} = L_u/Q_u S$$

c. Compute solid blocking (ε_{sb}).

$$\varepsilon_{sbw} = K_1 \tau_{1w} \text{ (WING VOLUME)}/C^{1.5}$$

$$\varepsilon_{sbB} = K_3 \tau_{1f} \text{ (BODY VOLUME)}/C^{1.5}$$

$$\varepsilon_{sb} = \varepsilon_{sbw} + \varepsilon_{sbB}$$

d. Compute wake blocking (ε_{wb}).

$$\varepsilon_{wb} = S\ C_{Do}/2C + 2.5\ S/C\ (C_D - C_{Di} - C_{Do})$$

e. Compute total blocking (ε).

$$\varepsilon = \varepsilon_{sb} + \varepsilon_{wb}$$

f. Correct lift coefficient.

$$C_L = C_{Lu}\ (1 - 2\varepsilon) - (\tau_2\ \Delta\alpha\ a)$$

where

$$\Delta\alpha = \delta\ S/C\ C_{Lu}\ 57.3$$

g. Correct α.

$$\alpha = \alpha_u + \Delta\alpha\ (1 + \tau_2) - \text{FLOW ANGULARITY}$$

h. Compute uncorrected moment coefficient about 25% MAC.

i. Correct moment coefficient.

$$C_M = C_{Ma}\ (1 - 2\varepsilon) + (.25\ \tau_2\ \Delta\alpha\ a)$$

j. Correct drag coefficient.

$$C_D = C_{Du}(1 - 2\varepsilon) - \delta C_{dw} - \delta C_{Db} + (\delta\ S/C\ C_L^2)$$

where

$$\delta C_{Dw} = K_1\ \tau_{1w}\ (\text{WING VOLUME})\ C_{Du}/C^{1.5}$$

$$\delta C_{Db} = K_3\ \tau_{1f}\ (\text{BODY VOLUME})\ C_{Dou}/C^{1.5}$$

Directional data reduction was essentially the same except measured drag was also corrected for drag due to the sideforce bar and lift data was sideforce data.

Due to inherent flow irregularities, wind tunnel airflow is generally not perfectly straight. Rather, there are generally regions of upwash and downwash within the tunnel. From test sideforce results, a downwash angle was determined as the geometric sideslip angle which resulted in zero sideforce. A downwash correction of .76 degrees for BASIC and .24 degrees for ARIA was used to correct the geometric angle of attack/sideslip.

The system of equations generated by the least square data fit routine was solved on the computer using the FORTRAN code in Appendix C of Reference 8.

APPENDIX B

Accuracy

Throughout the model/tunnel setup and testing operation great care was taken to minimize the errors.

Model measurement was accomplished with the model positioned above a steel surface plate which served as a reference for a Starrett height gauge, accurate to within 1/1000 of an inch. The surface plate and the model were each leveled to within one minute of arc.

A Bausch and Lomb positioning telescope was used to establish a constant model pitch/yaw pivot axis reference. Following tunnel speed stabilization and model angle of incidence reset, the front lift wire attach point was realigned with the scope cross hairs.

Geometric angle of attack/sideslip was calibrated to within three minutes of arc by referencing the tunnel installed mechanical counter to an inclinometer positioned on the model. By always approaching mechanical counter readings in the calibrated direction the effect of gear backlash/slippage was minimized and model incidence was accurate to within six minutes of arc during testing.

The springless wind tunnel scales were preloaded to keep them in their linear range. Rear lift and drag scales were graduated in .02 pound increments and had a reading accuracy within .01 pound. The front lift scale was

graduated in .05 pound increments and had a reading accuracy within .02 pounds.

Tunnel dynamic pressure was measured on a micromanometer graduated in .001 inch of water increments. Dynamic pressure was maintained within .01 inch of water during data recording.

Multiple readings were recorded at each test point, both wind on and wind off. The readings were averaged to reduce data scatter.

APPENDIX C

Test Conditions

DYNAMIC PRESSURE 60 PSF
AVERAGE VELOCITY 232.5 FT/SEC
AVERAGE R_e=303000 (Based on MAC = .2269 feet)

RUN	STABILIZER ANGLE (°)	RUDDER ANGLE (°)	CONFIGURATION	TUNNEL MOUNT
1	0.0	0.0	BASIC	LONGITUDINAL
2	2.0	0.0	BASIC	LONGITUDINAL
3	4.0	0.0	BASIC	LONGITUDINAL
4	6.0	0.0	BASIC	LONGITUDINAL
5	7.0	0.0	BASIC	LONGITUDINAL
6	0.0	0.0	BASIC	LONGITUDINAL
7	-2.0	0.0	BASIC	LONGITUDINAL
8	-6.0	0.0	BASIC	LONGITUDINAL
9	-10.0	0.0	BASIC	LONGITUDINAL
10	0.0	0.0	ARIA	LONGITUDINAL
11	4.0	0.0	ARIA	LONGITUDINAL
12	7.0	0.0	ARIA	LONGITUDINAL
13	-2.0	0.0	ARIA	LONGITUDINAL
14	-6.0	0.0	ARIA	LONGITUDINAL
15	-10.0	0.0	ARIA	LONGITUDINAL
16	0.0	0.0	ARIA	LONGITUDINAL
17	-2.0	0.0	BASIC	LONGITUDINAL
18	0.0	0.0	BASIC	SIDESLIP
19	0.0	5.0	BASIC	SIDESLIP

RUN	STABILIZER ANGLE(°)	RUDDER ANGLE(°)	CONFIGURATION	TUNNEL MOUNT
20	0.0	-5.0	BASIC	SIDESLIP
21	0.0	-15.0	BASIC	SIDESLIP
22	0.0	-25.0	BASIC	SIDESLIP
23	0.0	15.0	BASIC	SIDESLIP
24	0.0	25.0	BASIC	SIDESLIP
25	0.0	25.0	BASIC	SIDESLIP
26	0.0	0.0	BASIC	SIDESLIP
27	0.0	0.0	ARIA	SIDESLIP
28	0.0	-5.0	ARIA	SIDESLIP
29	0.0	-15.0	ARIA	SIDESLIP
30	0.0	-25.0	ARIA	SIDESLIP
31	0.0	5.0	ARIA	SIDESLIP
32	0.0	15.0	ARIA	SIDESLIP
33	0.0	25.0	ARIA	SIDESLIP
34	0.0	0.0	ARIA	SIDESLIP
35	0.0	0.0	BASIC	SIDESLIP
36	0.0	5.0	BASIC	SIDESLIP
37	0.0	-25.0	BASIC	SIDESLIP
38	0.0	15.0	BASIC	SIDESLIP
39	0.0	5.0	BASIC	SIDESLIP
40	0.0	-5.0	BASIC	SIDESLIP

APPENDIX D

Graphical Test Results

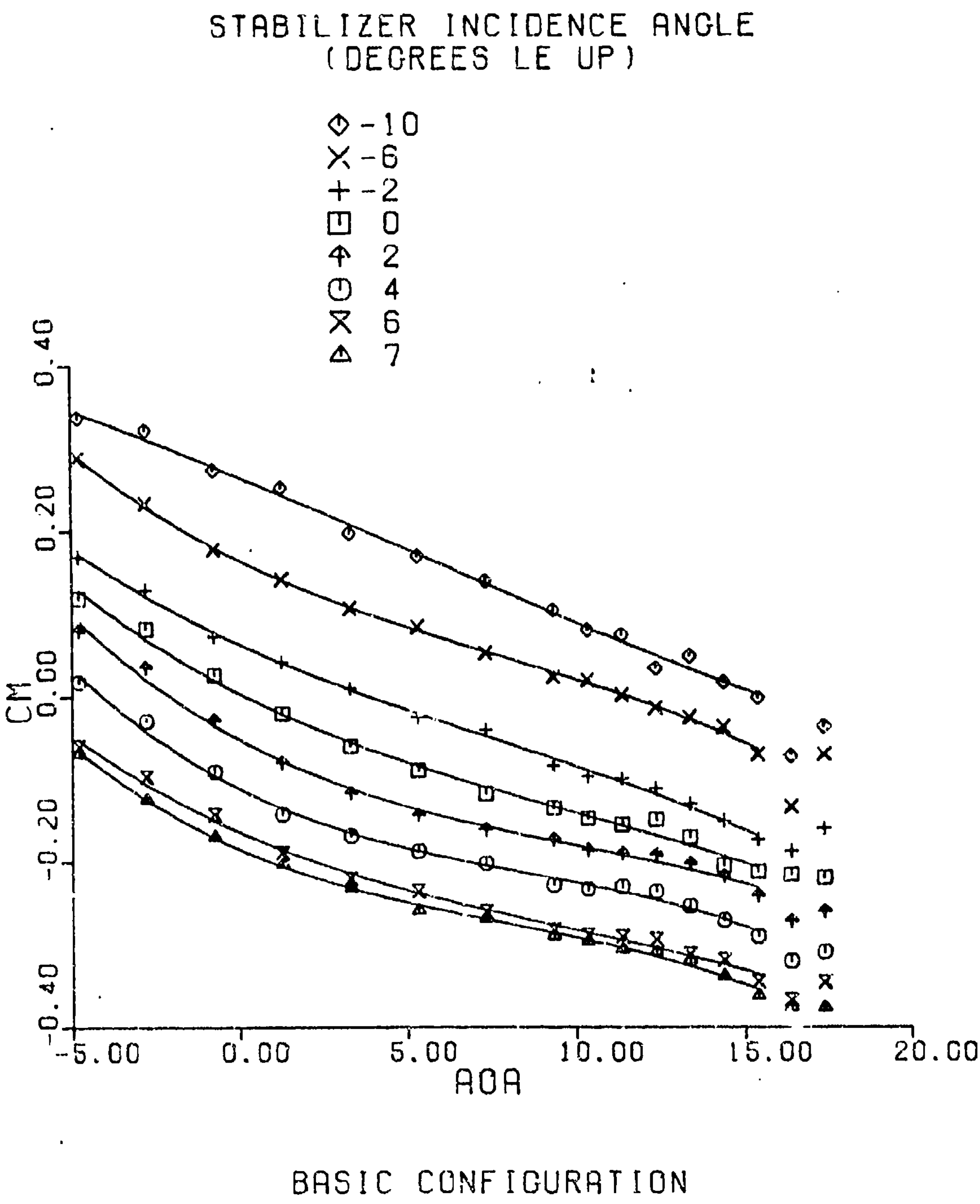


Fig. D-1. C_M vs α, BASIC Configuration
(C_M about 25% MAC)

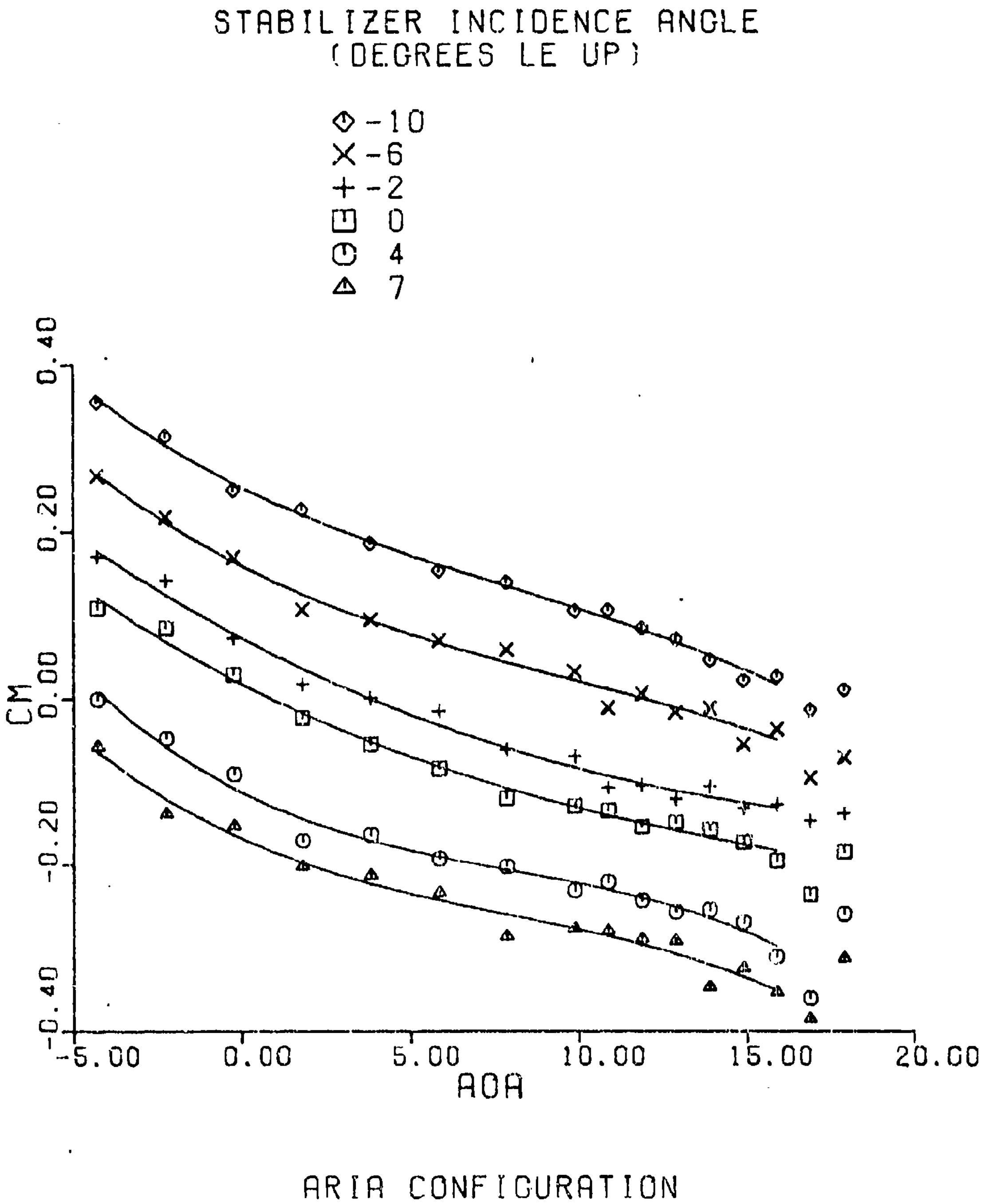


Fig. D-2. C_M vs α, ARIA Configuration
(C_M about 25% MAC)

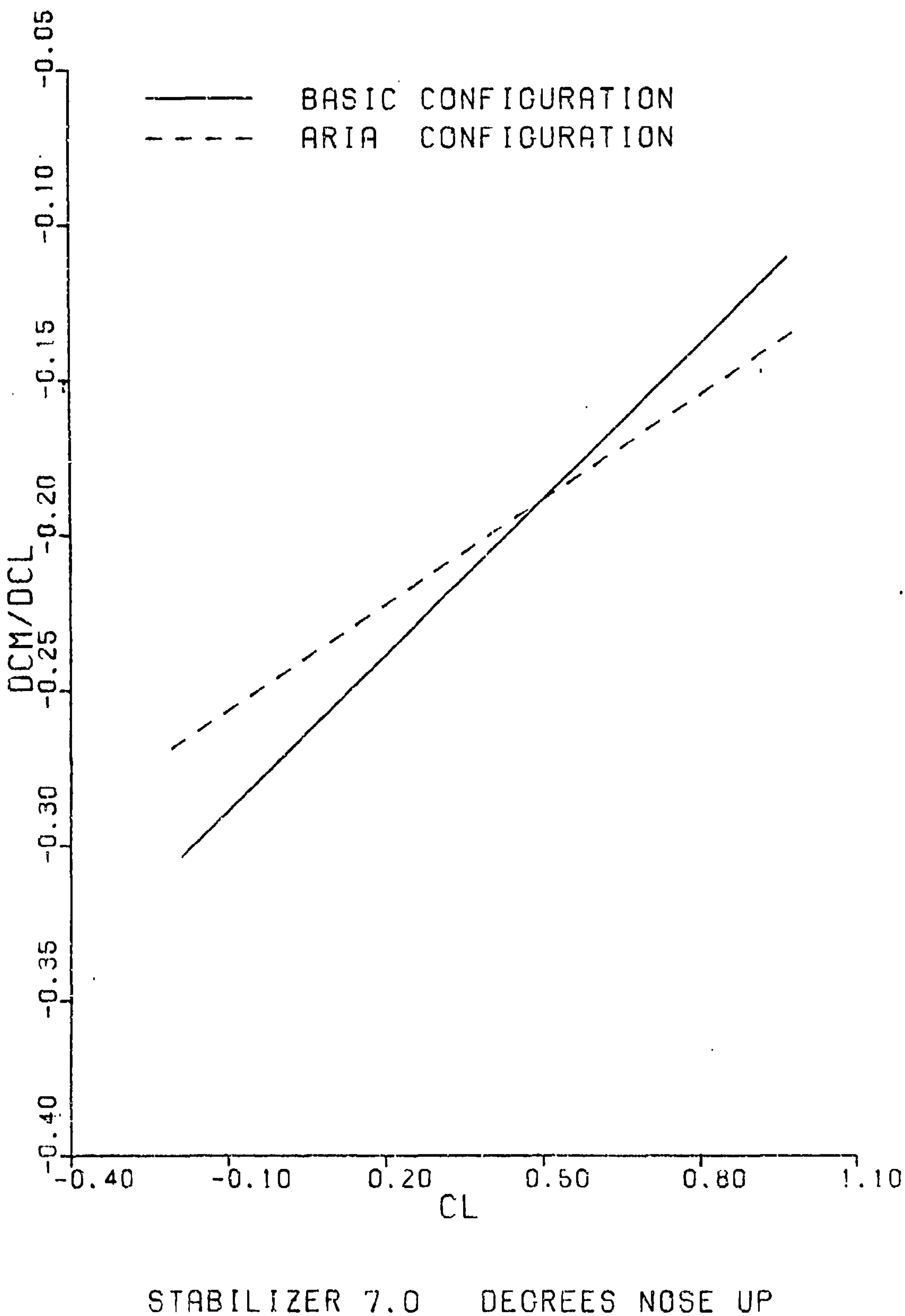


Fig. D-3. dC_M/dC_L vs C_L, Stabilizer 7.0 Degrees

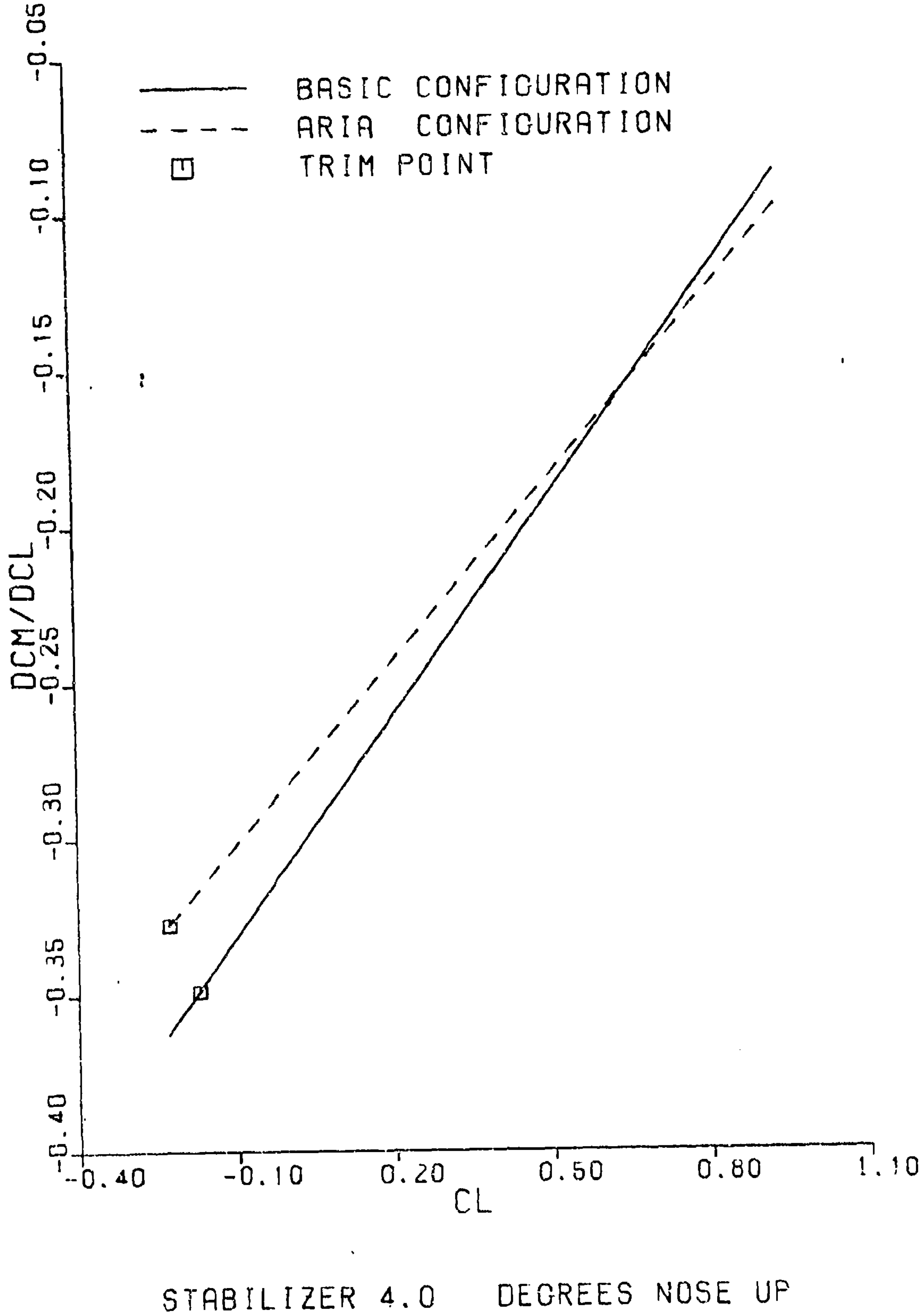


Fig. D-4. dC_M/dC_L vs C_L, Stabilizer 4.0 Degrees

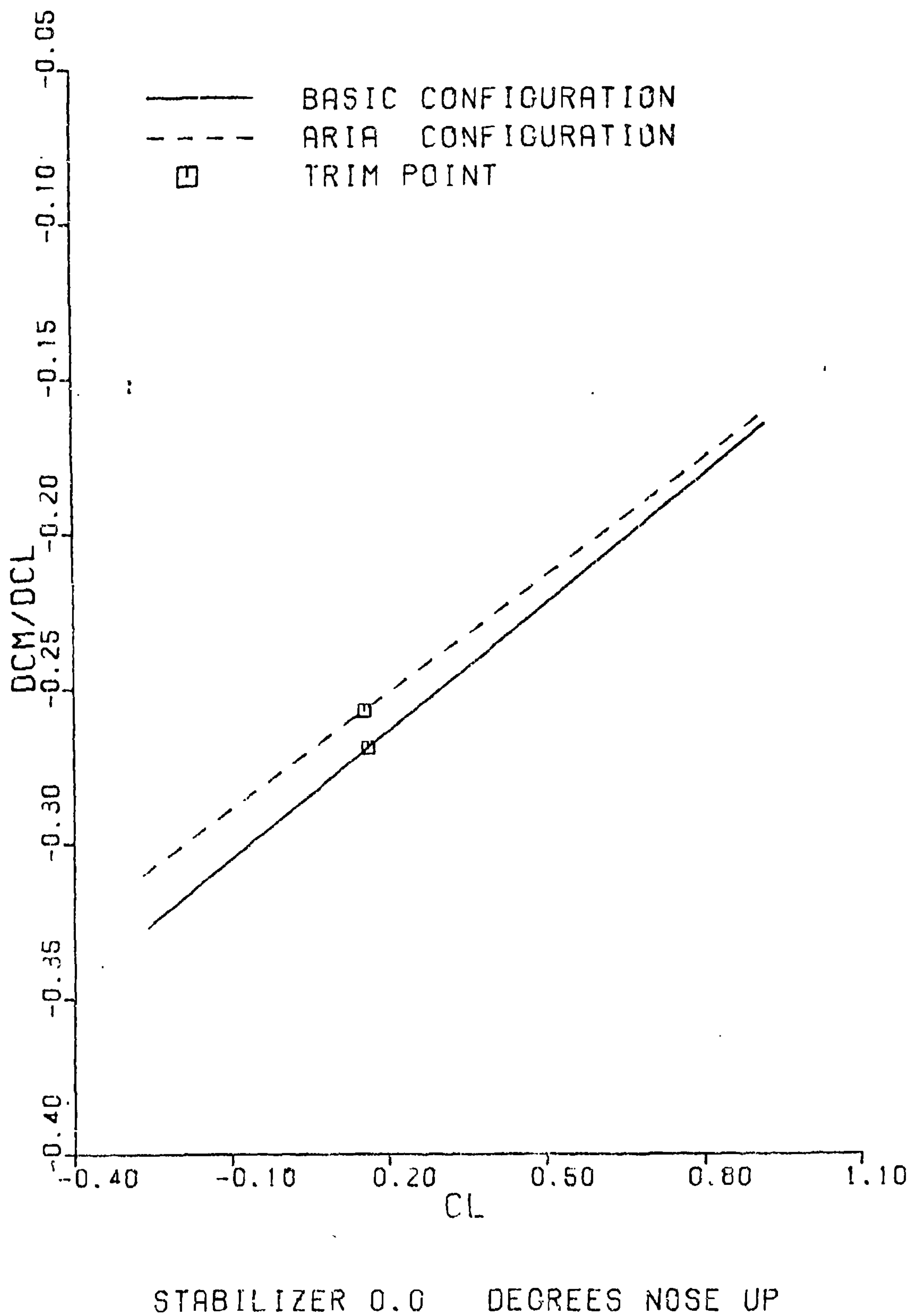


Fig. D-5. dC_M/dC_L vs C_L, Stabilizer 0.0 Degrees

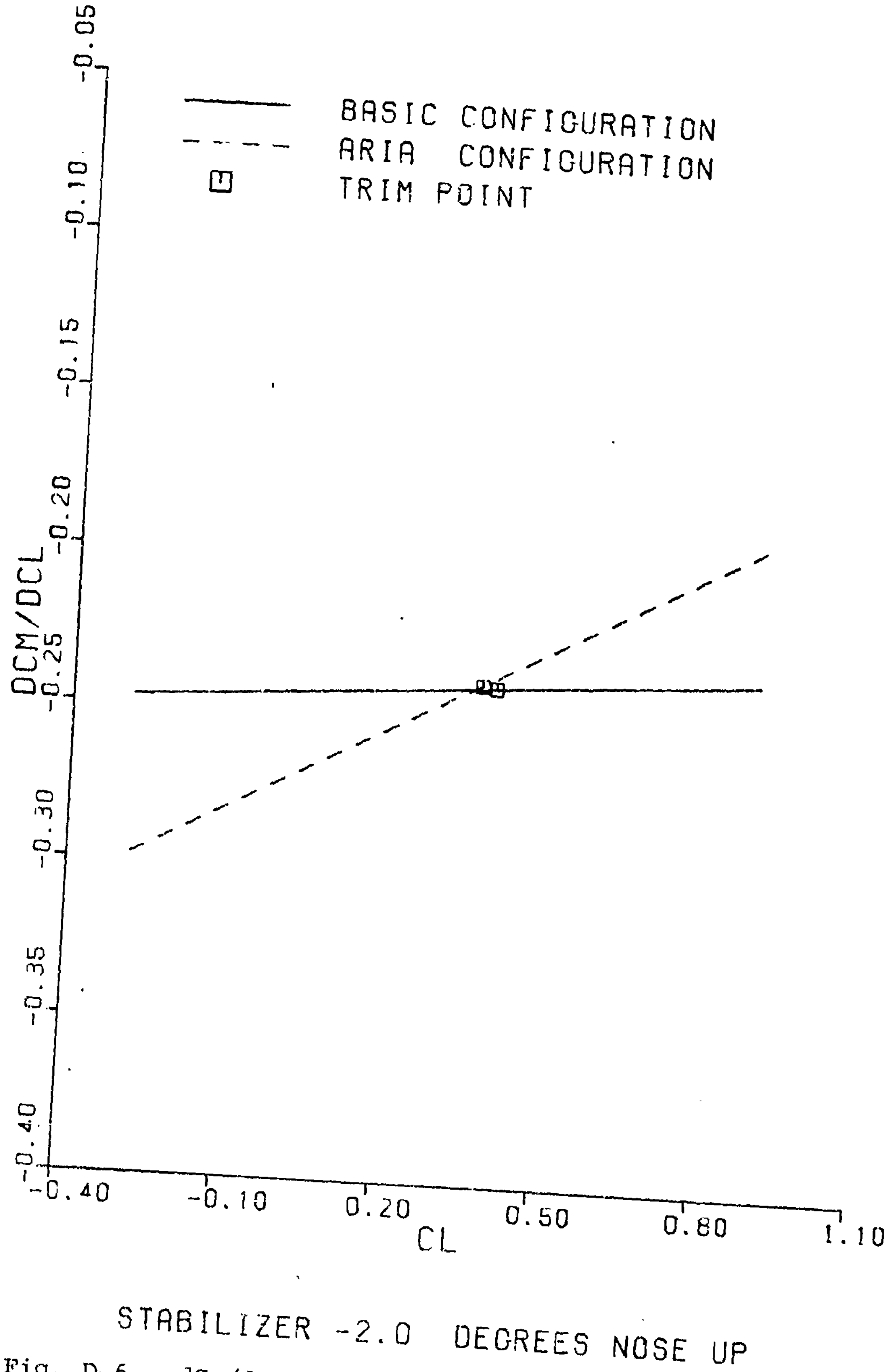


Fig. D-6. dC_M/dC_L vs C_L, Stabilizer -2.0 Degrees

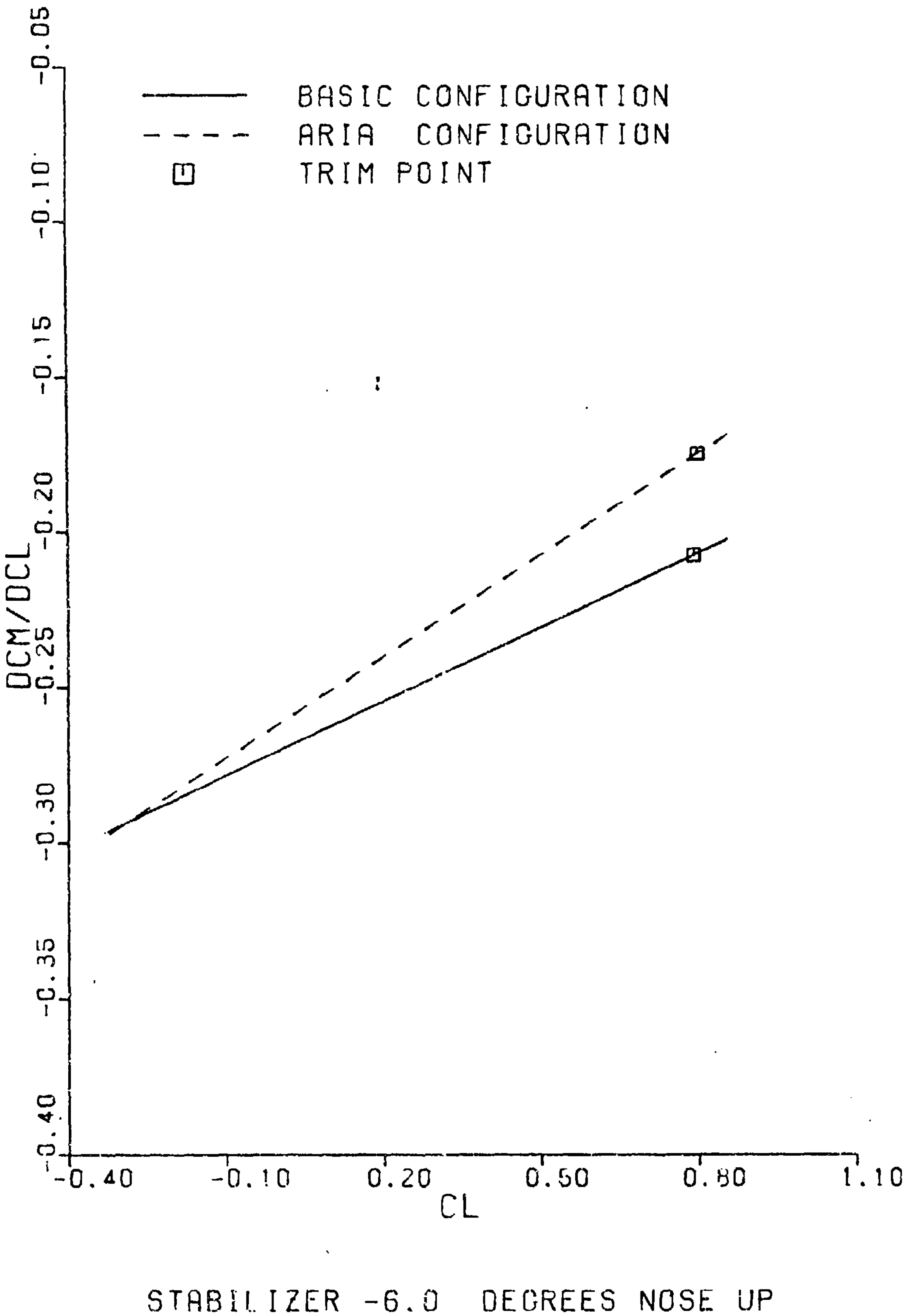
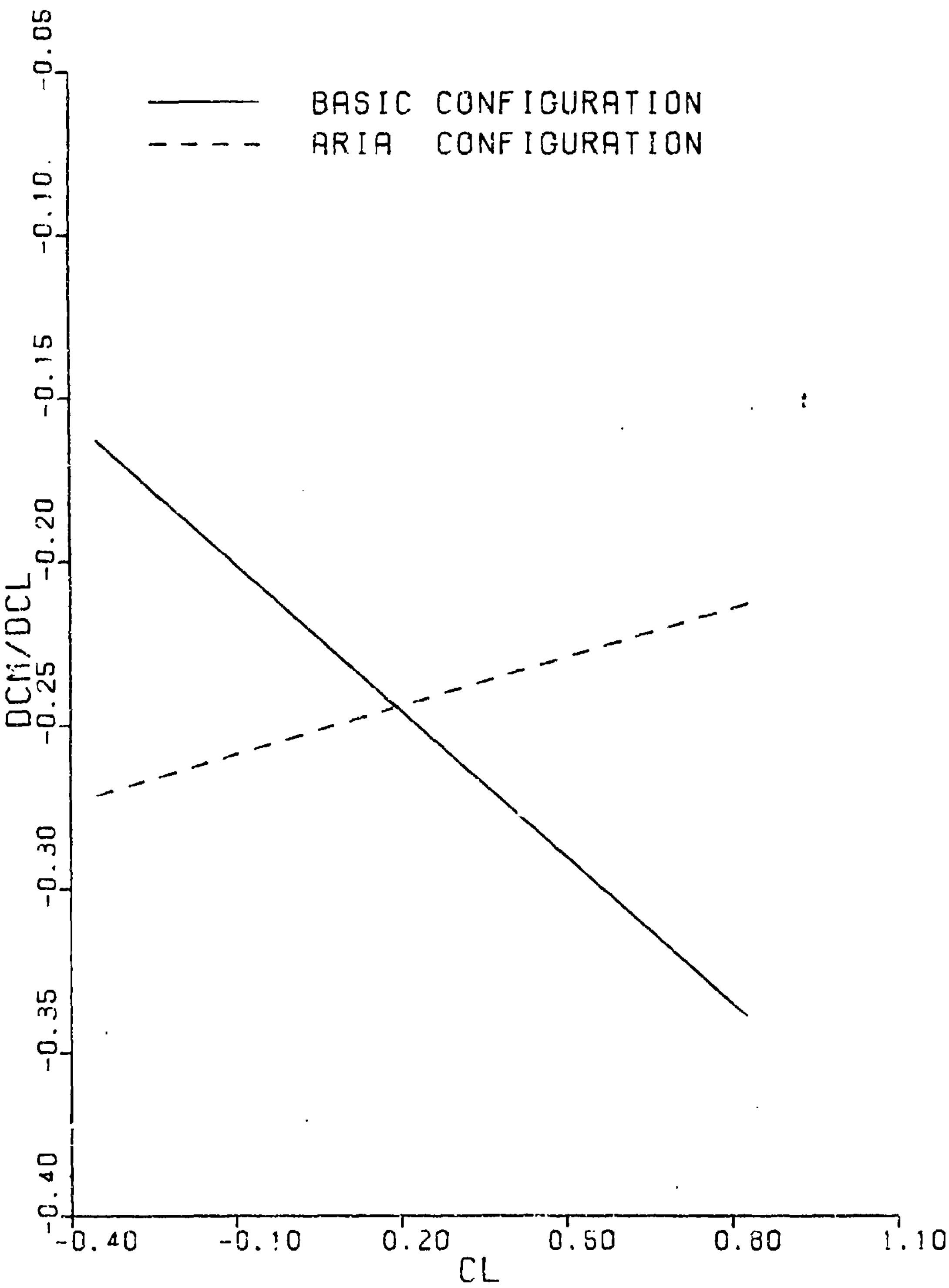


Fig. D-7. dC_M/dC_L vs C_L, Stabilizer -6.0 Degrees



STABILIZER -10.0 DEGREES NOSE UP

Fig. D-8. dC_M/dC_L vs C_L, Stabilizer -10.0 Degrees

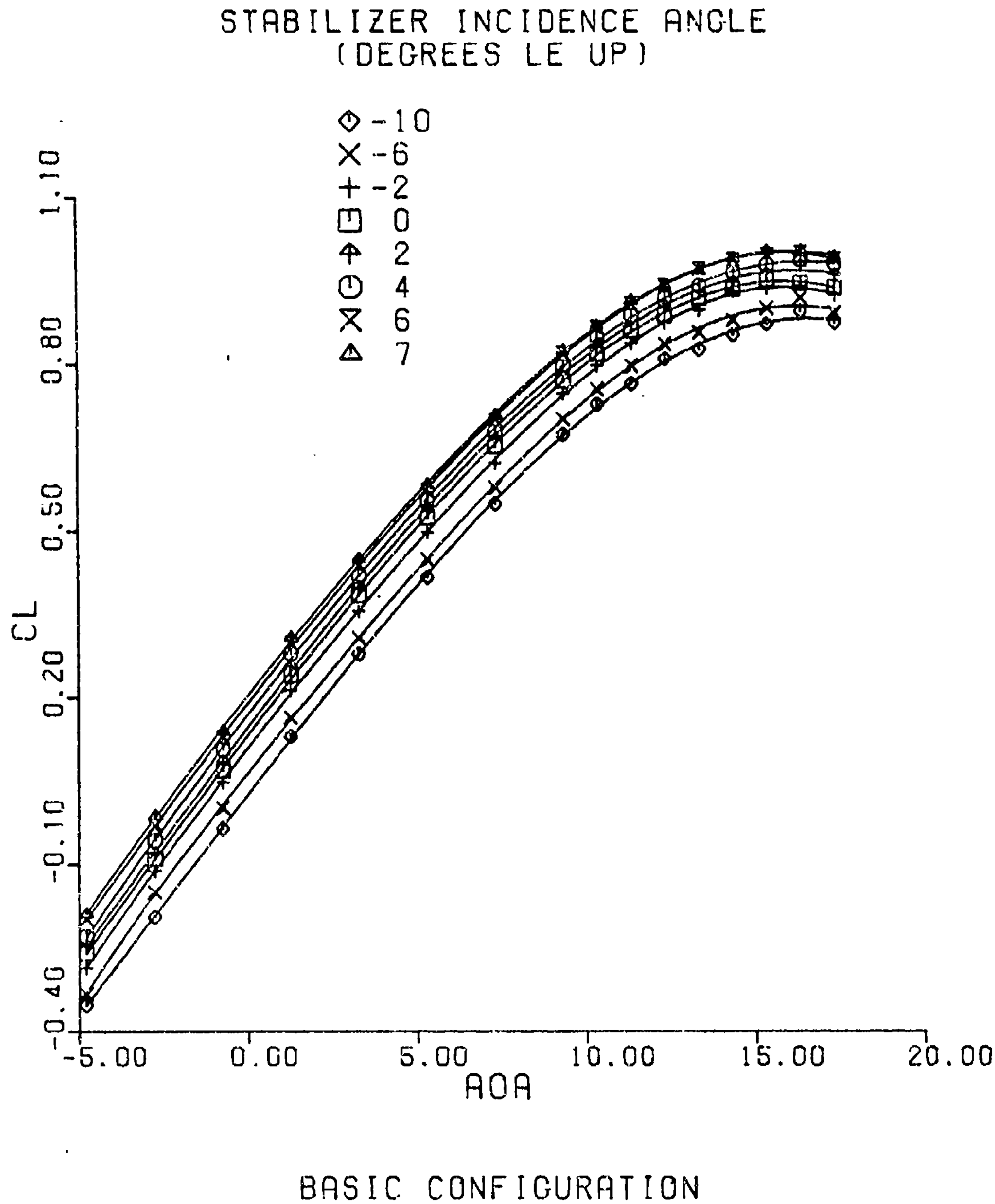


Fig. D-9. C_L vs α, BASIC Configuration

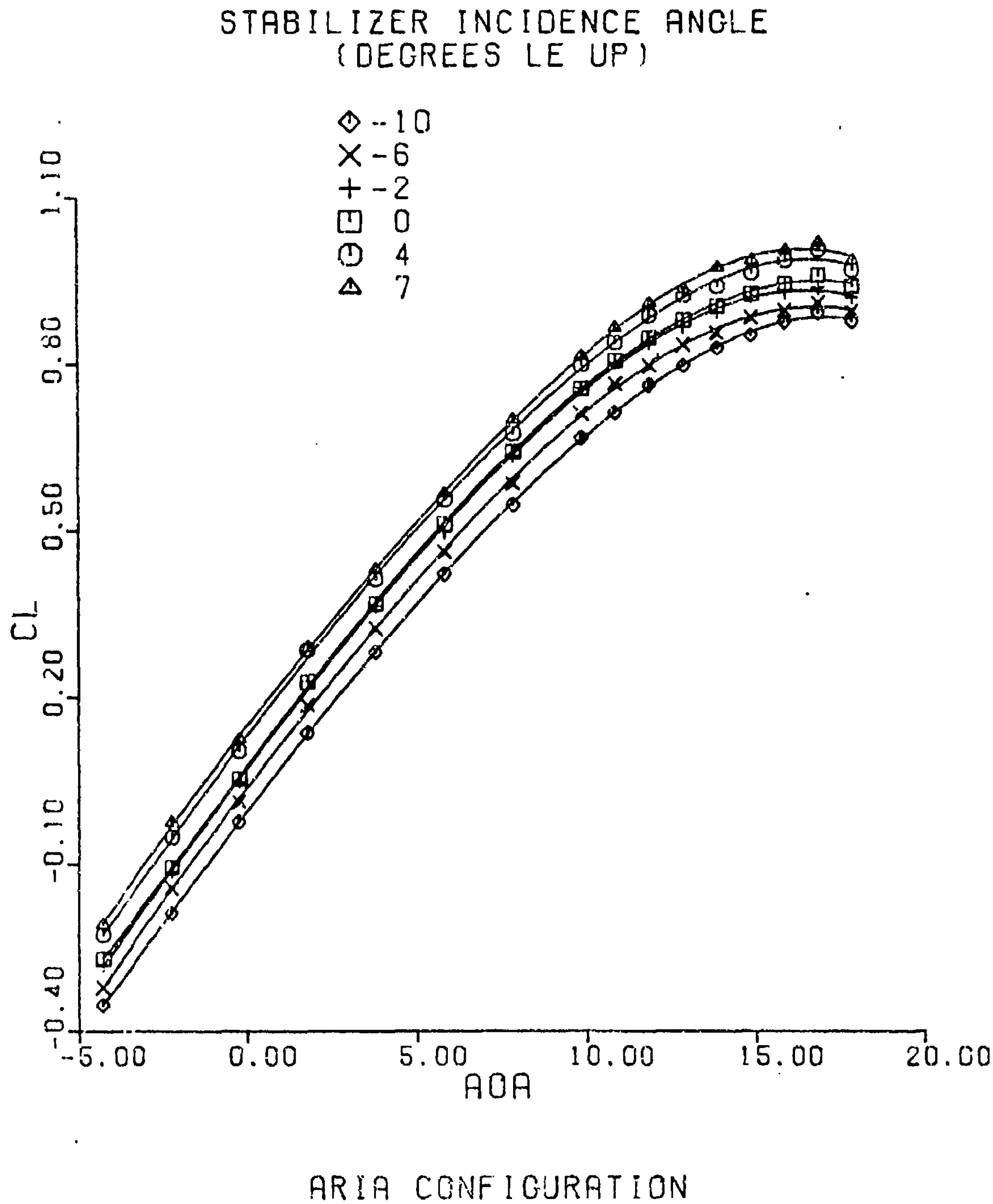


Fig. D-10. C_L vs α, ARIA Configuration

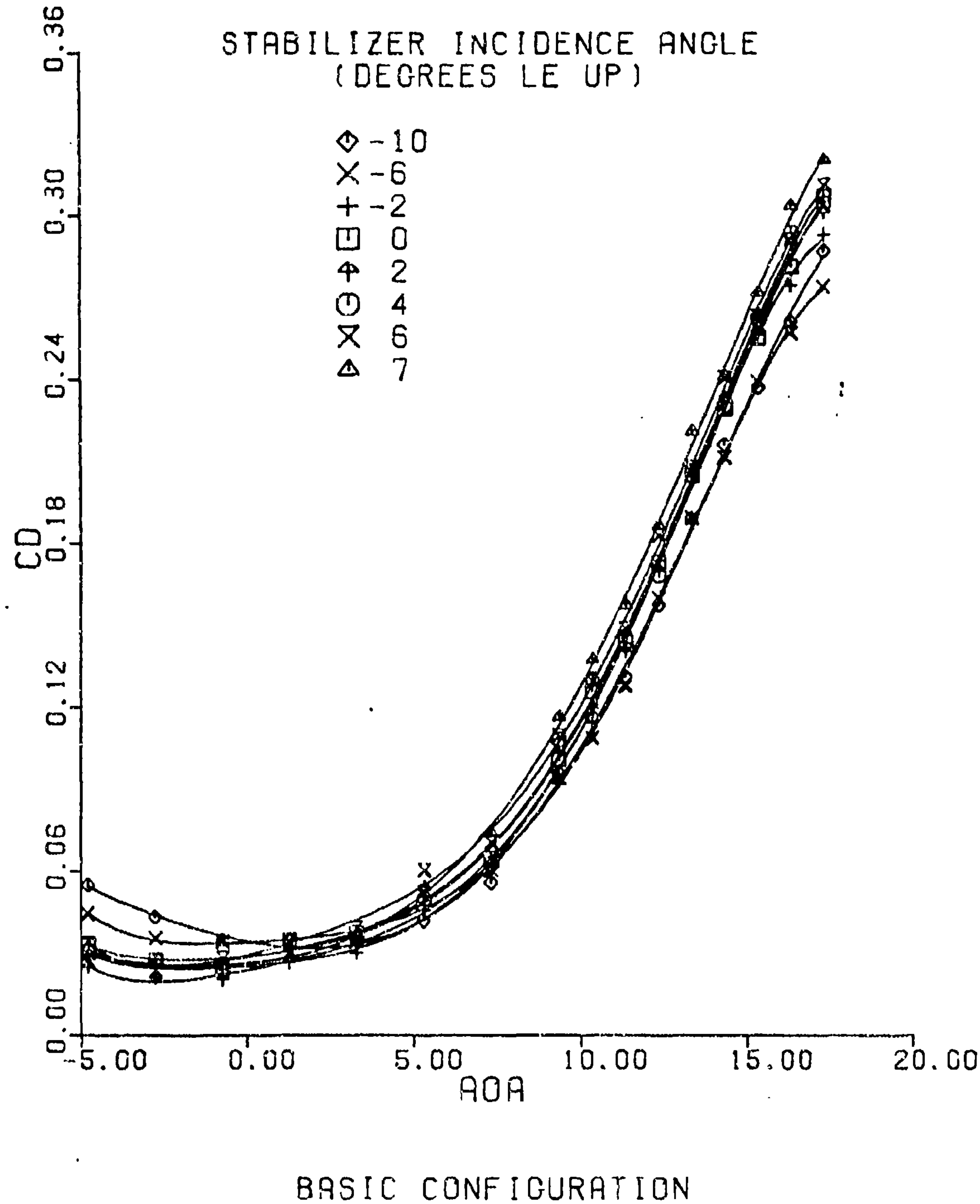


Fig. D-11. C_D vs α, BASIC Configuration

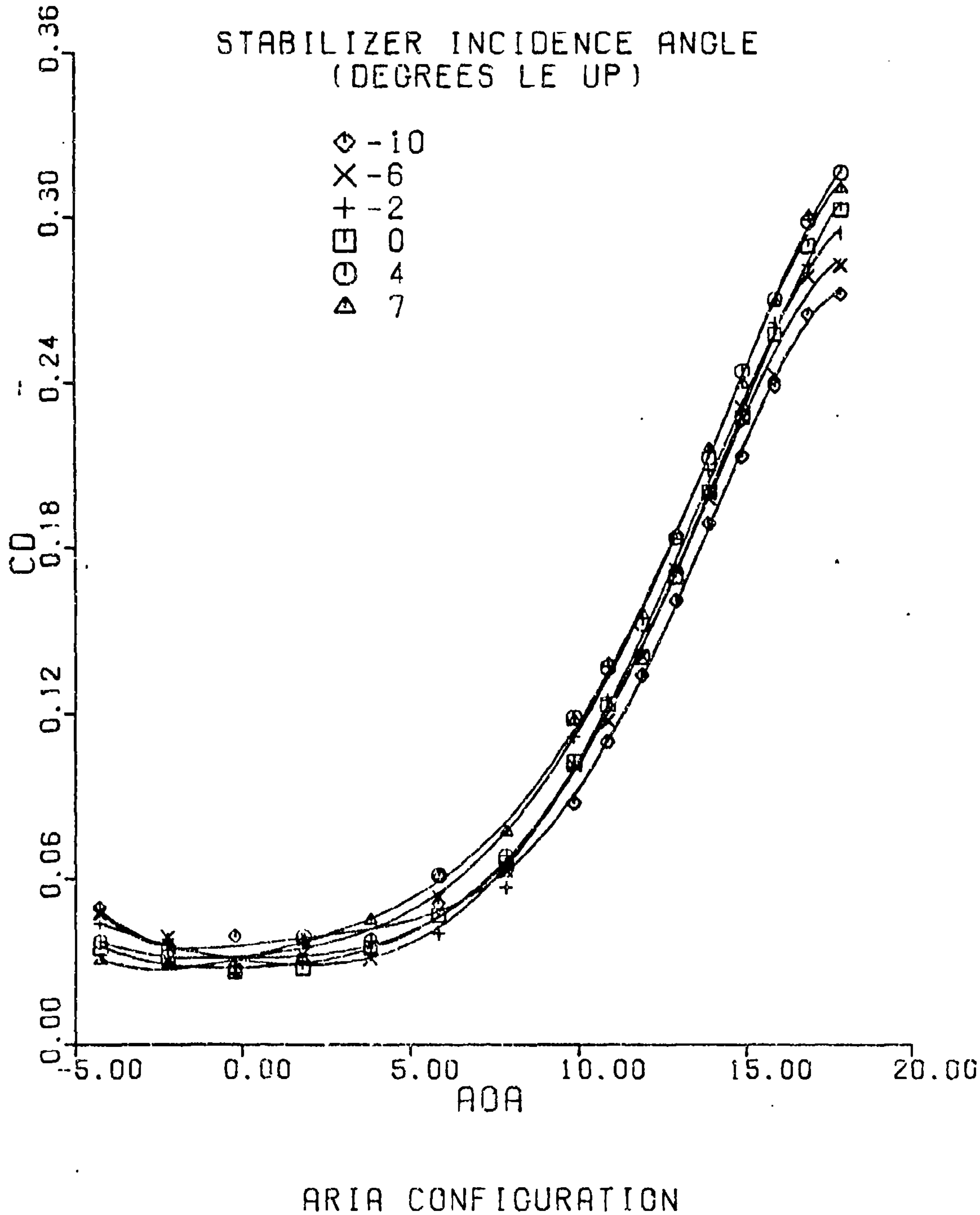


Fig. D-12. C_D vs α, ARIA Configuration

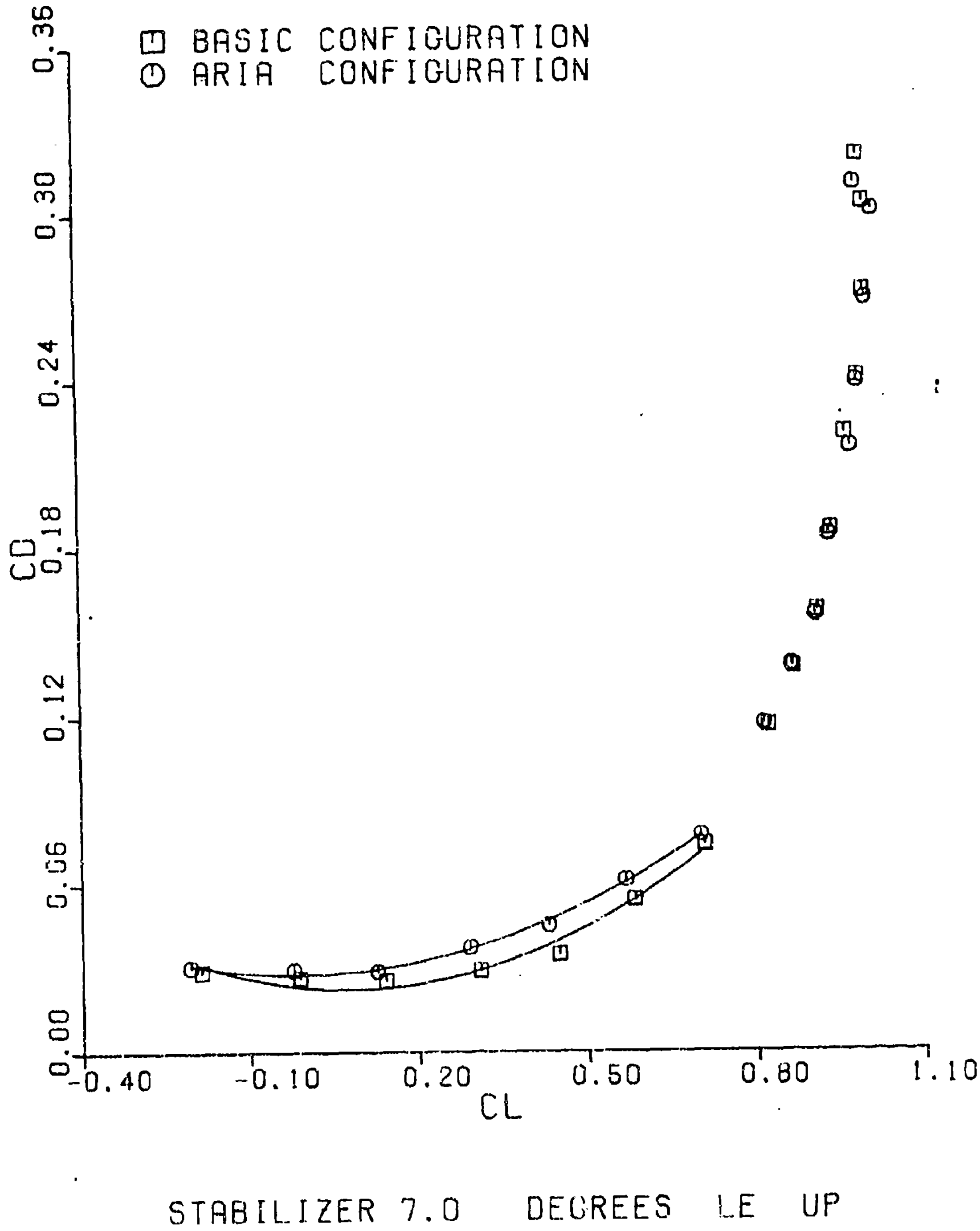


Fig. D-13. C_D vs C_L, Stabilizer 7.0 Degrees

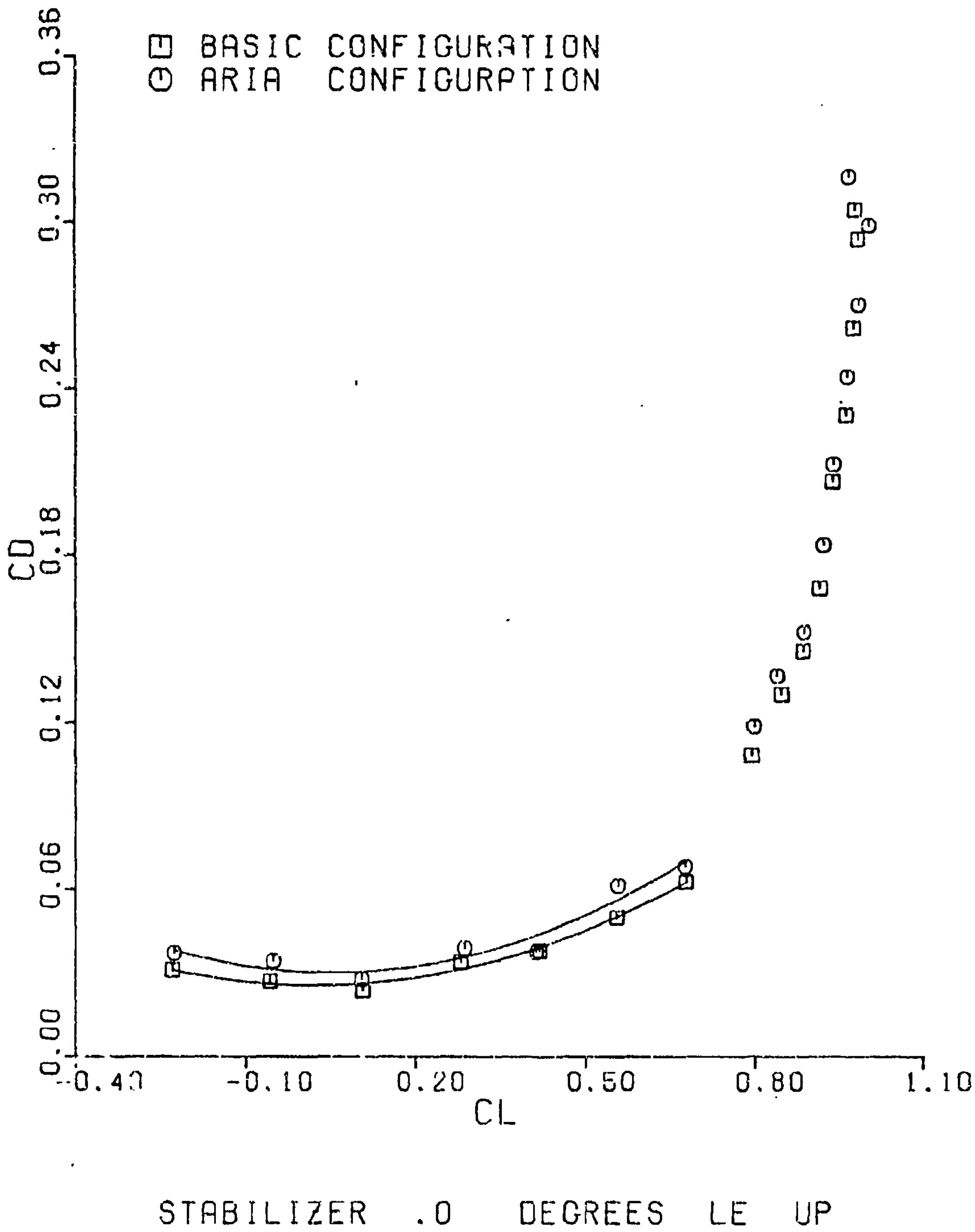


Fig. D-14. C_D vs C_L, Stabilizer 4.0 Degrees

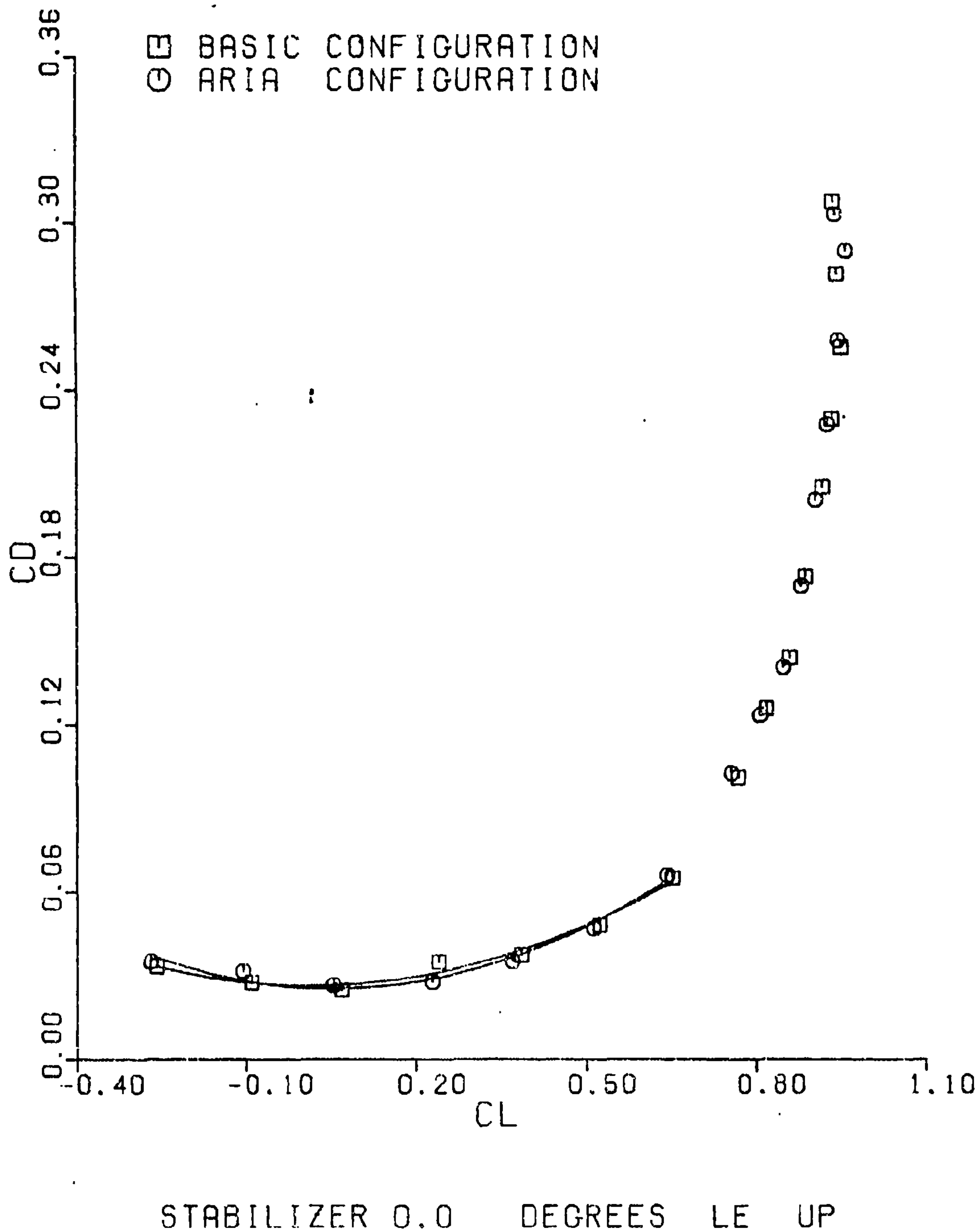


Fig. D-15. C_D vs C_L, Stabilizer 0.0 Degrees

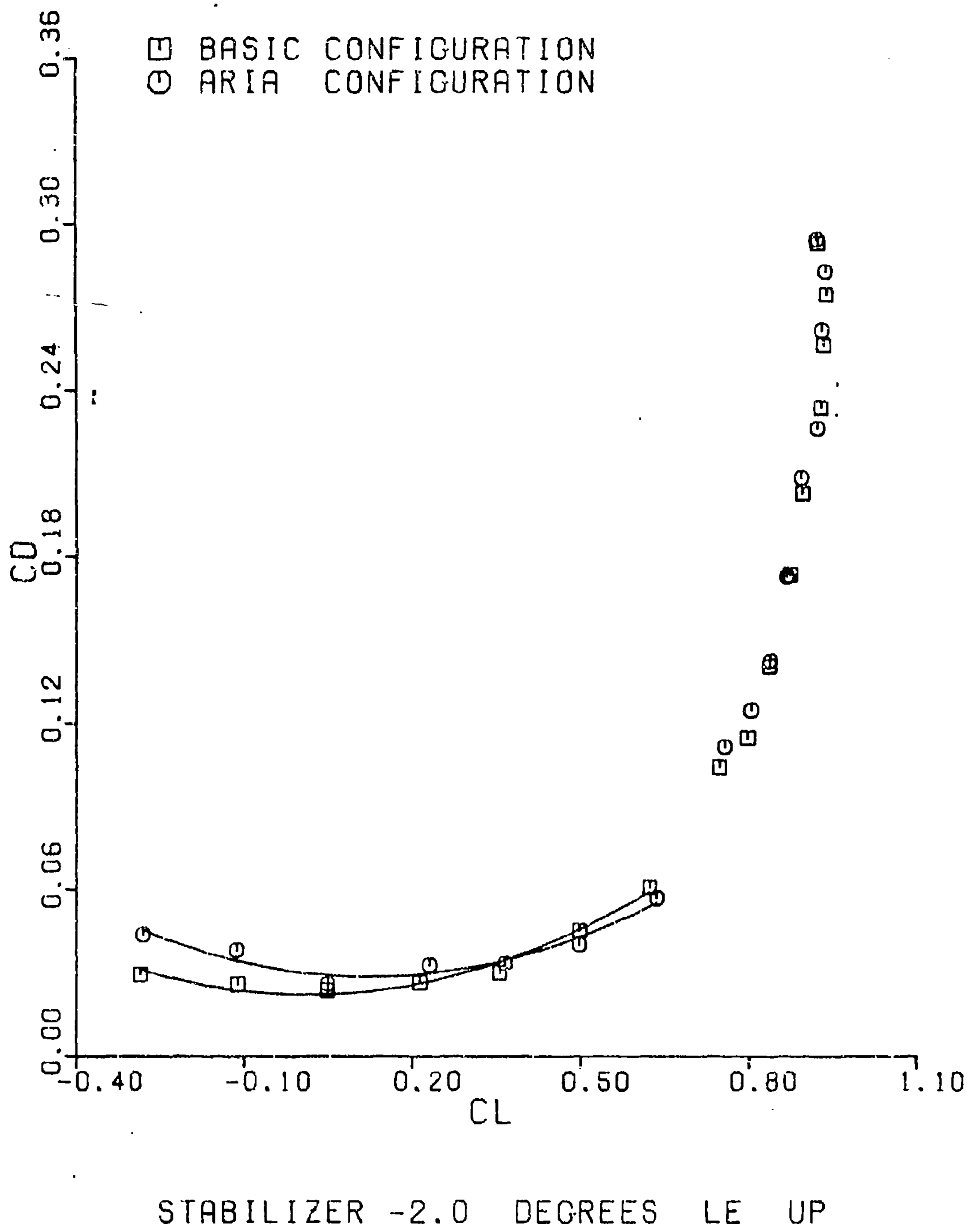


Fig. D-16. C_D vs C_L, Stabilizer -2.0 Degrees

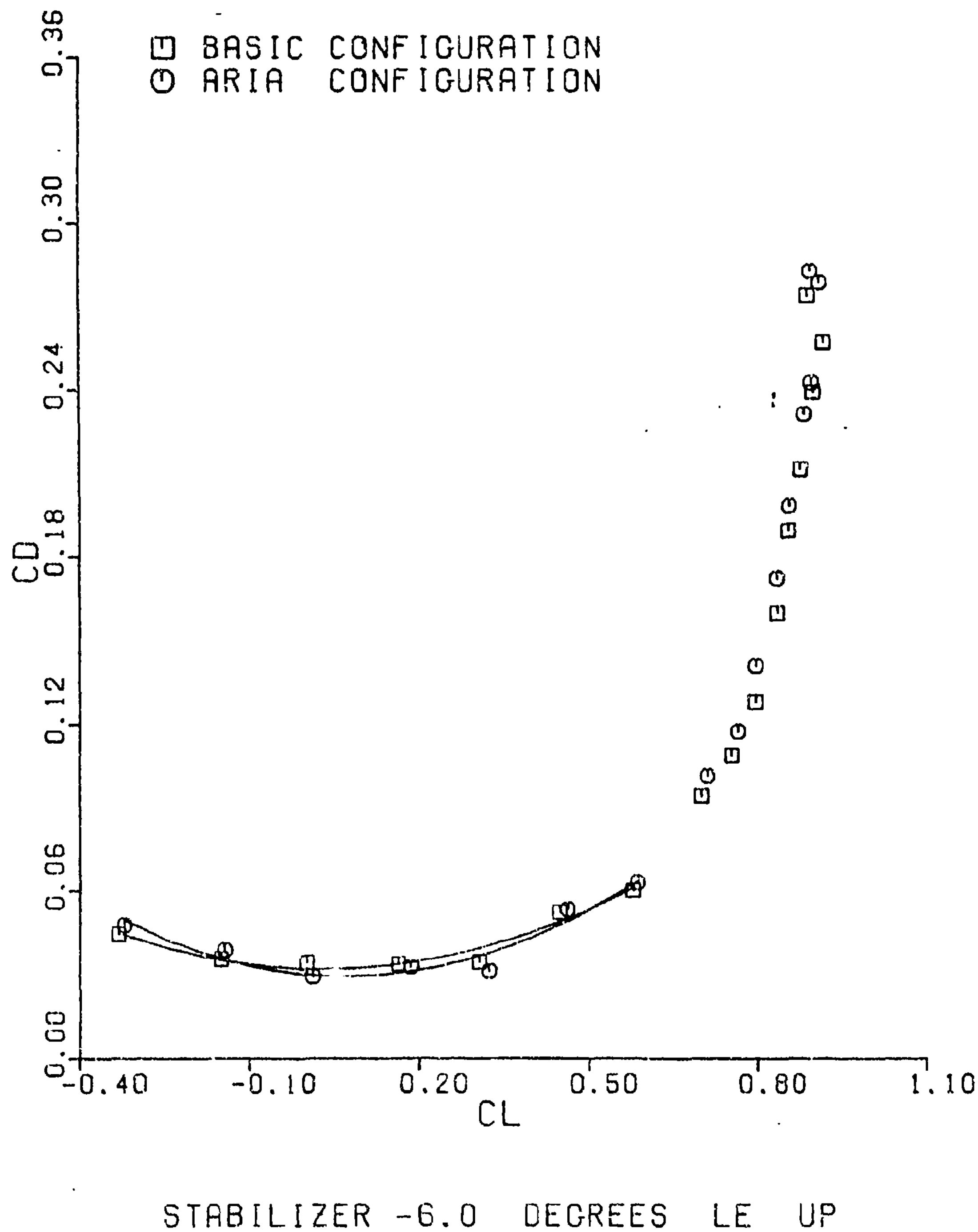


Fig. D-17. C_D vs C_L, Stabilizer -6.0 Degrees

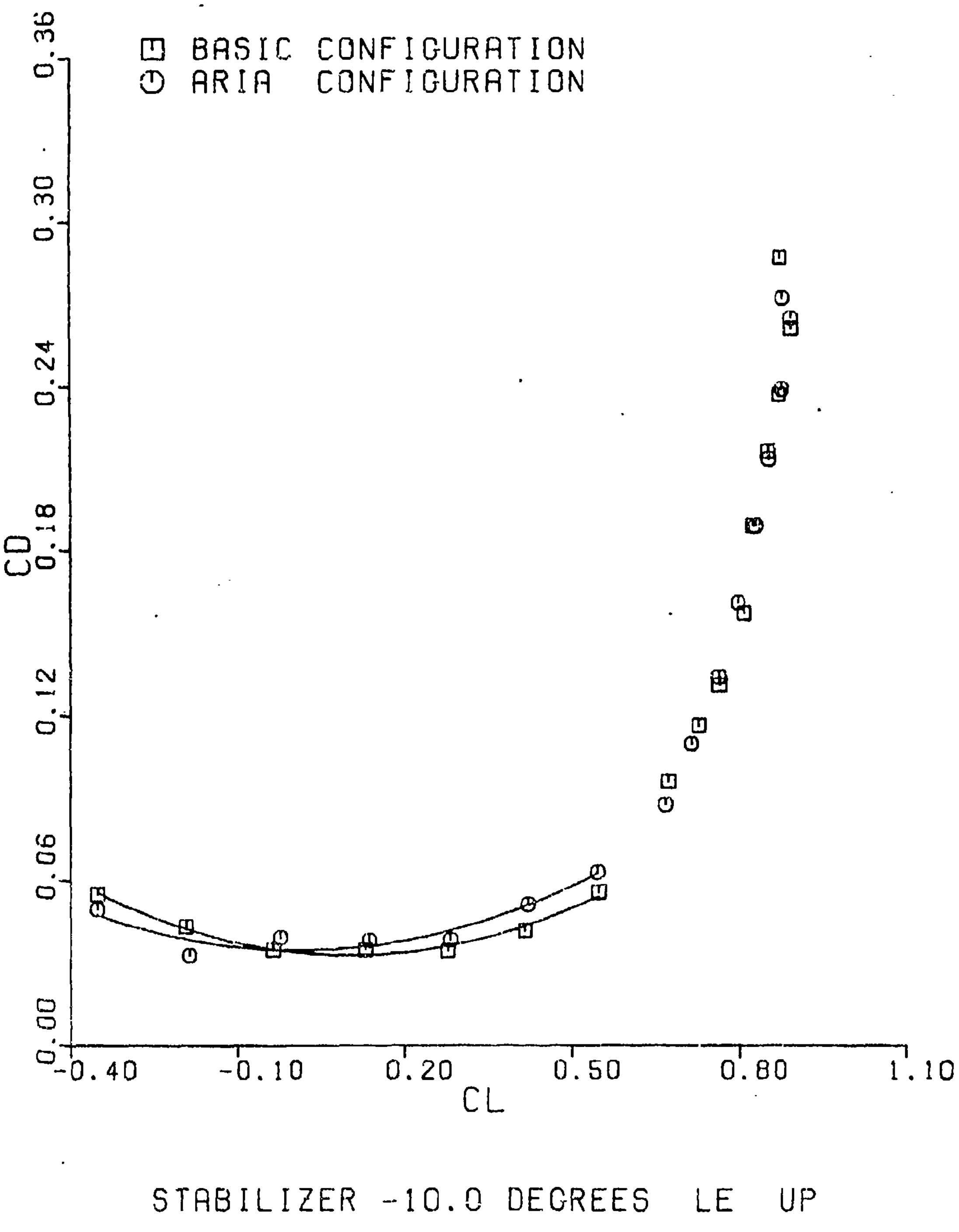


Fig. D-18. C_D vs C_L, Stabilizer -10.0 Degrees

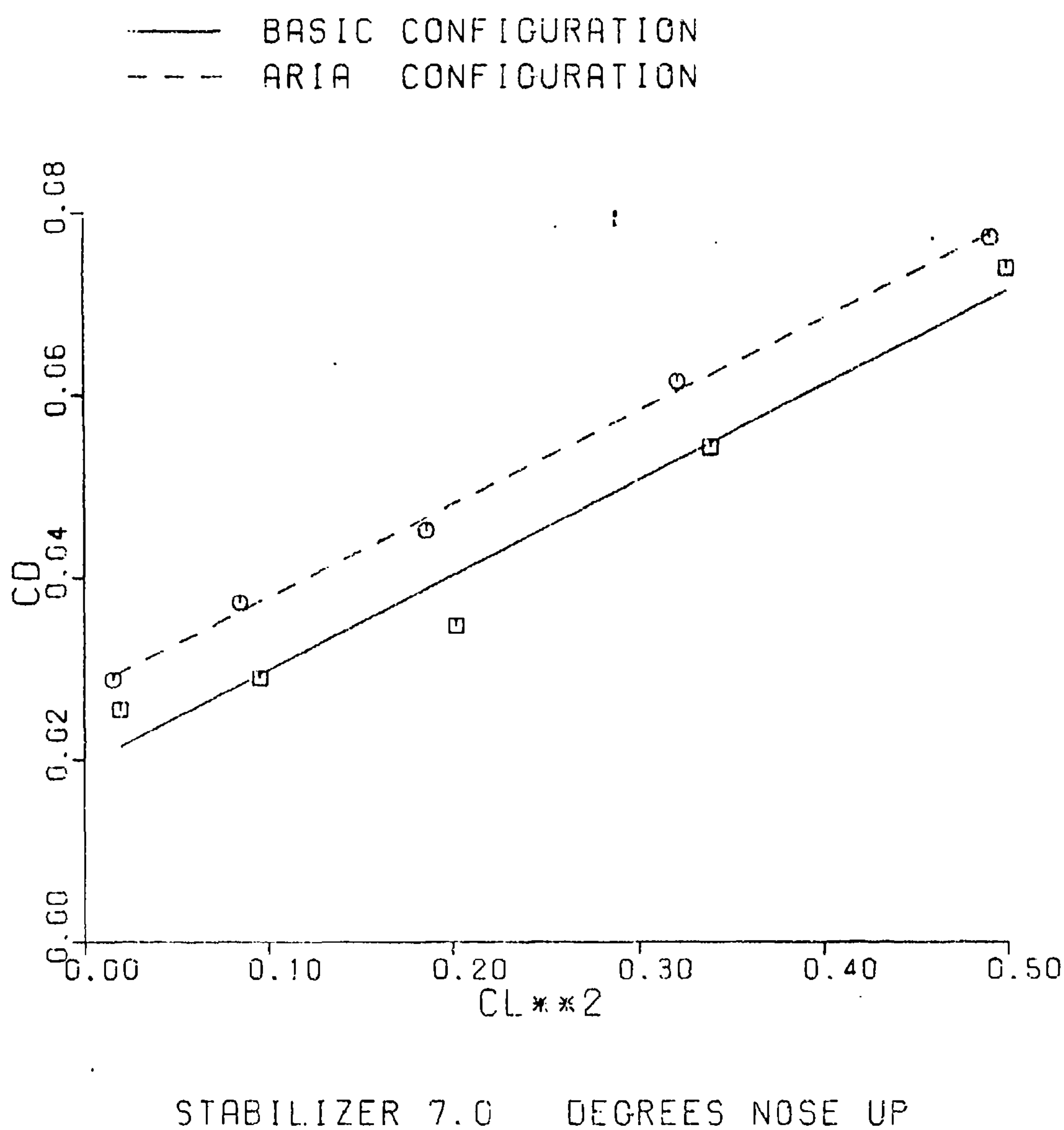


Fig. D-19. C_D vs C_L^2, Stabilizer 7.0 Degrees

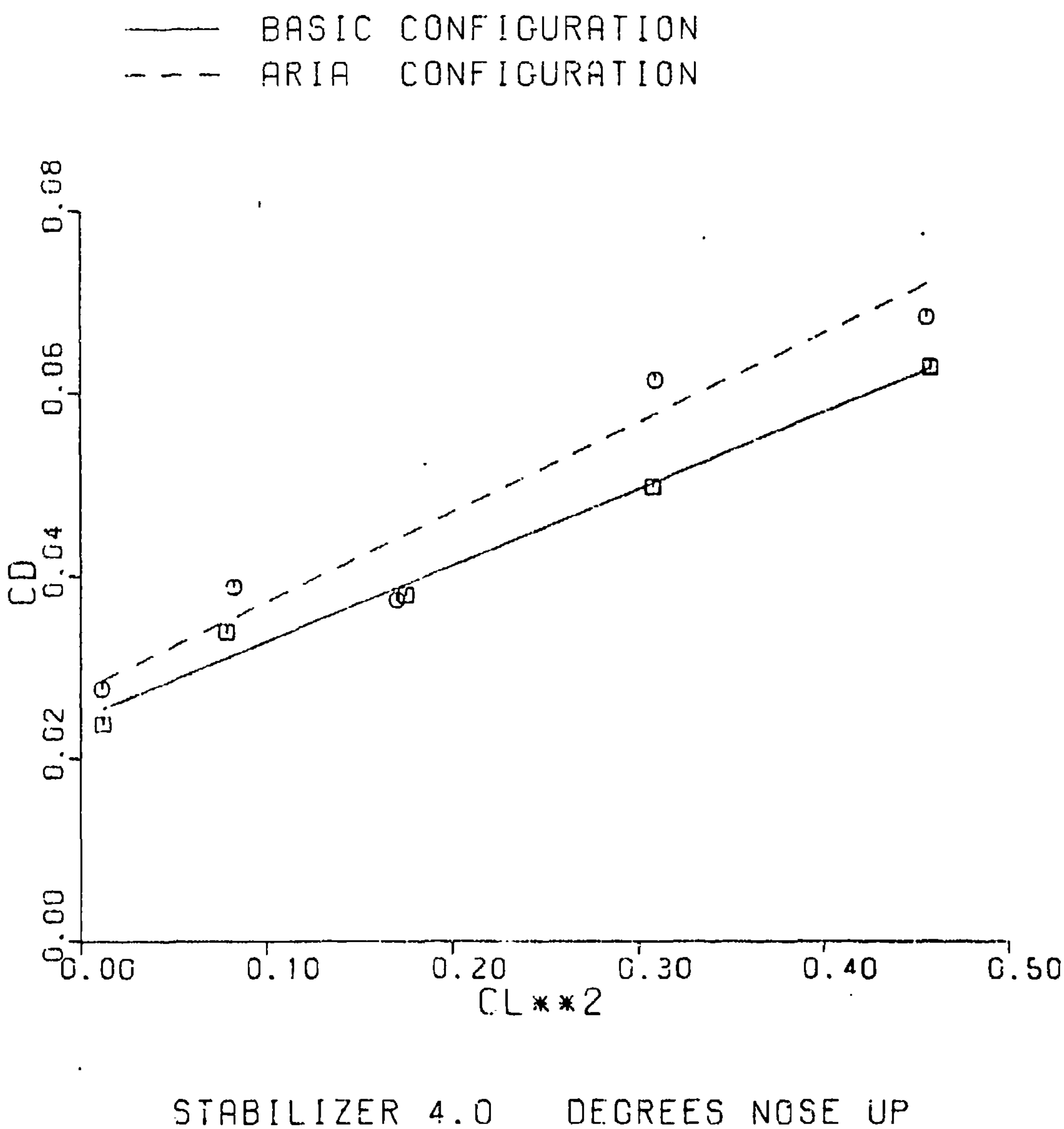


Fig. D-20. C_D vs C_L^2, Stabilizer 4.0 Degrees

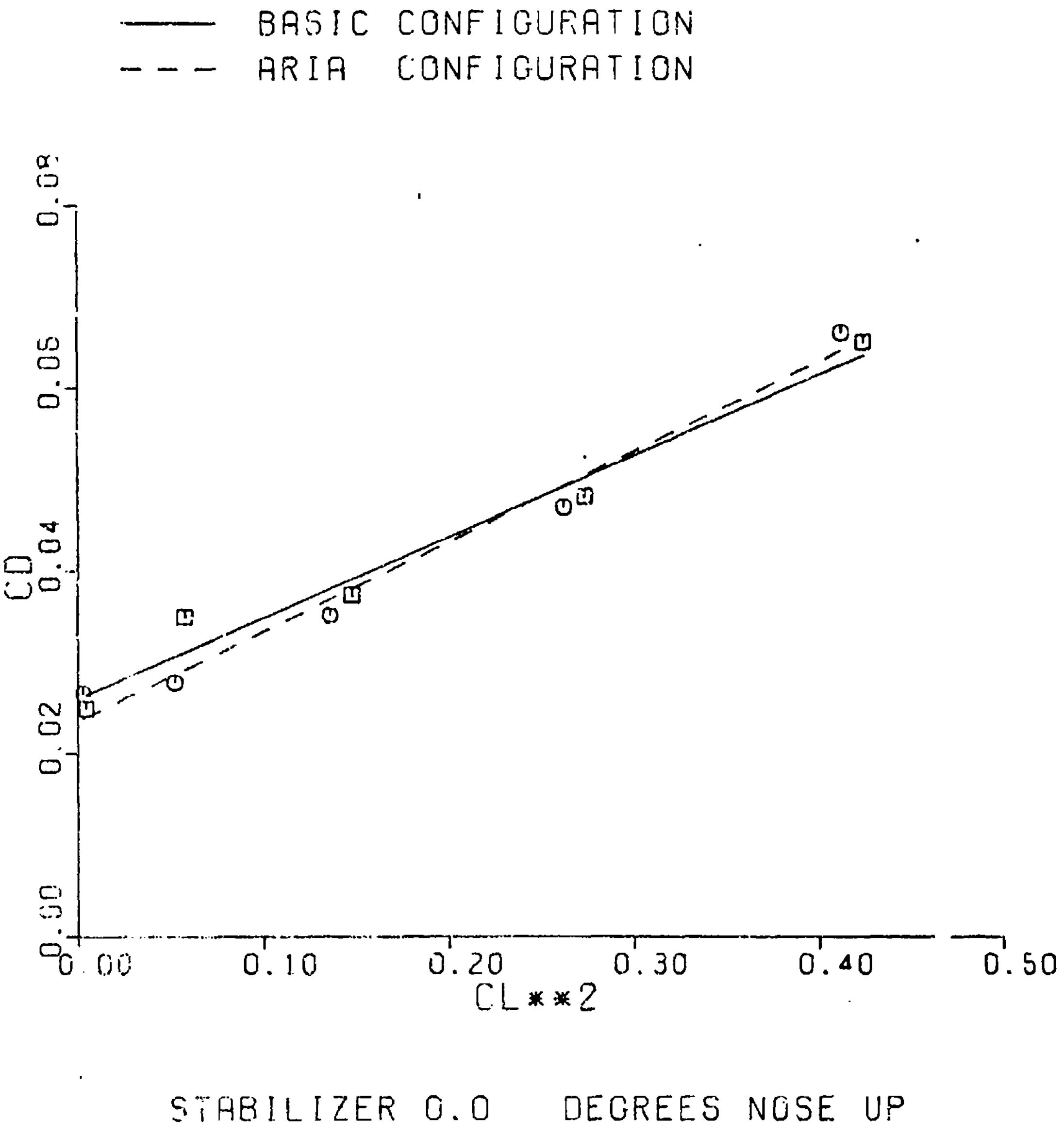
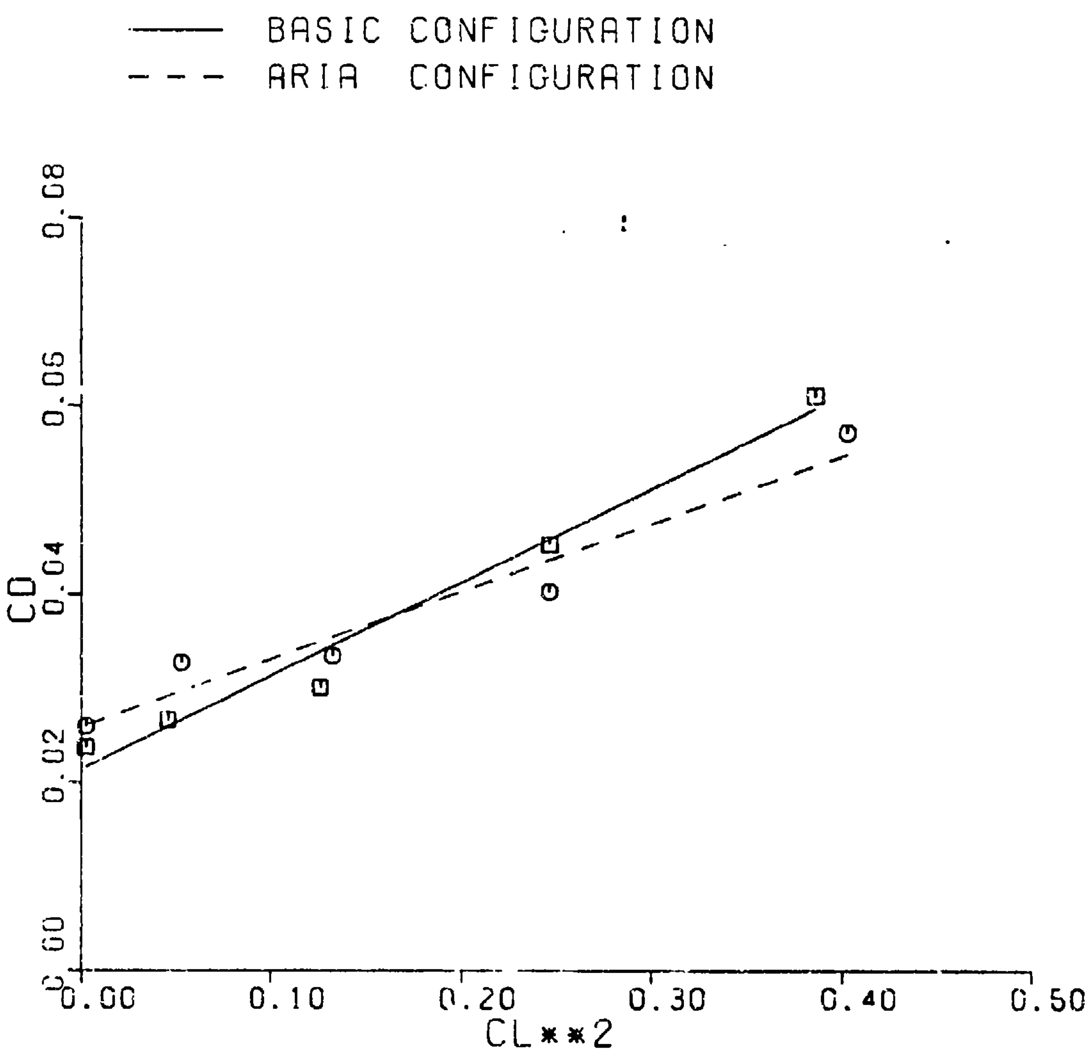
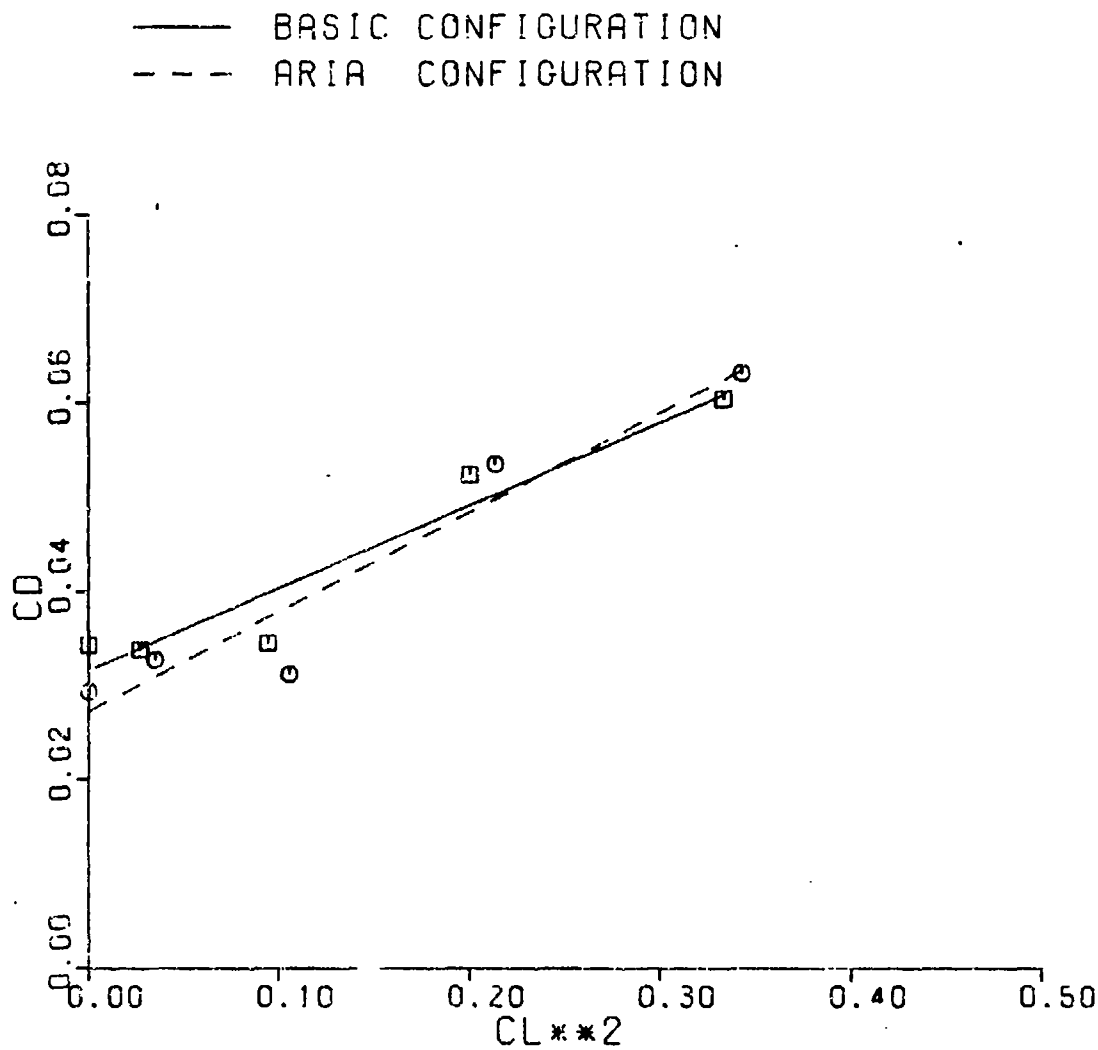


Fig. D-21. C_D vs C_L^2, Stabilizer 0.0 Degrees



STABILIZER -2.0 DEGREES NOSE UP

Fig. D-22. C_D vs C_L^2, Stabilizer -2.0 Degrees



STABILIZER -6.0 DEGREES NOSE UP

Fig. D-23. C_D vs C_L^2, Stabilizer -6.0 Degrees

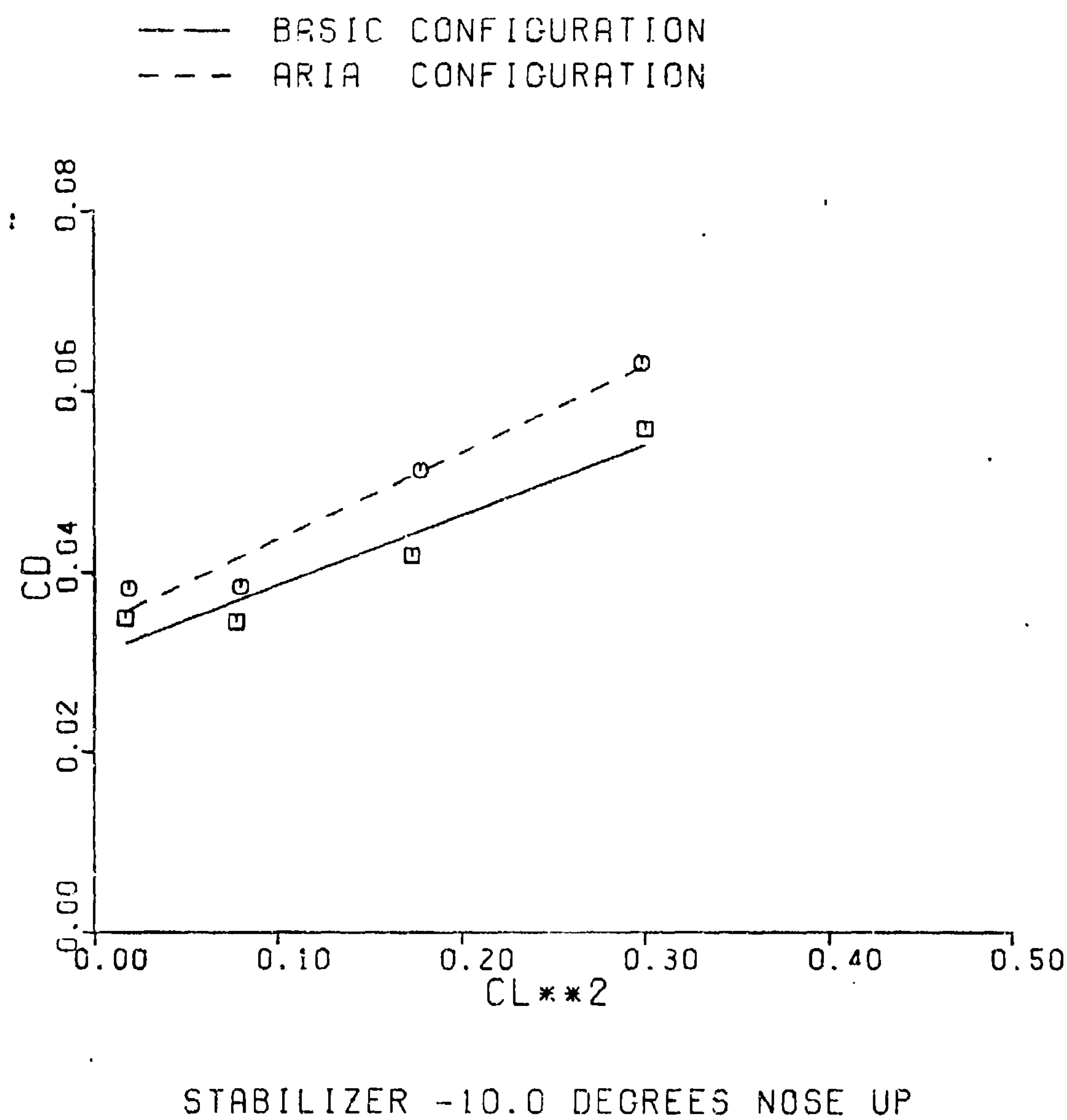


Fig. D-24. C_D vs C_L^2, Stabilizer -10.0 Degrees

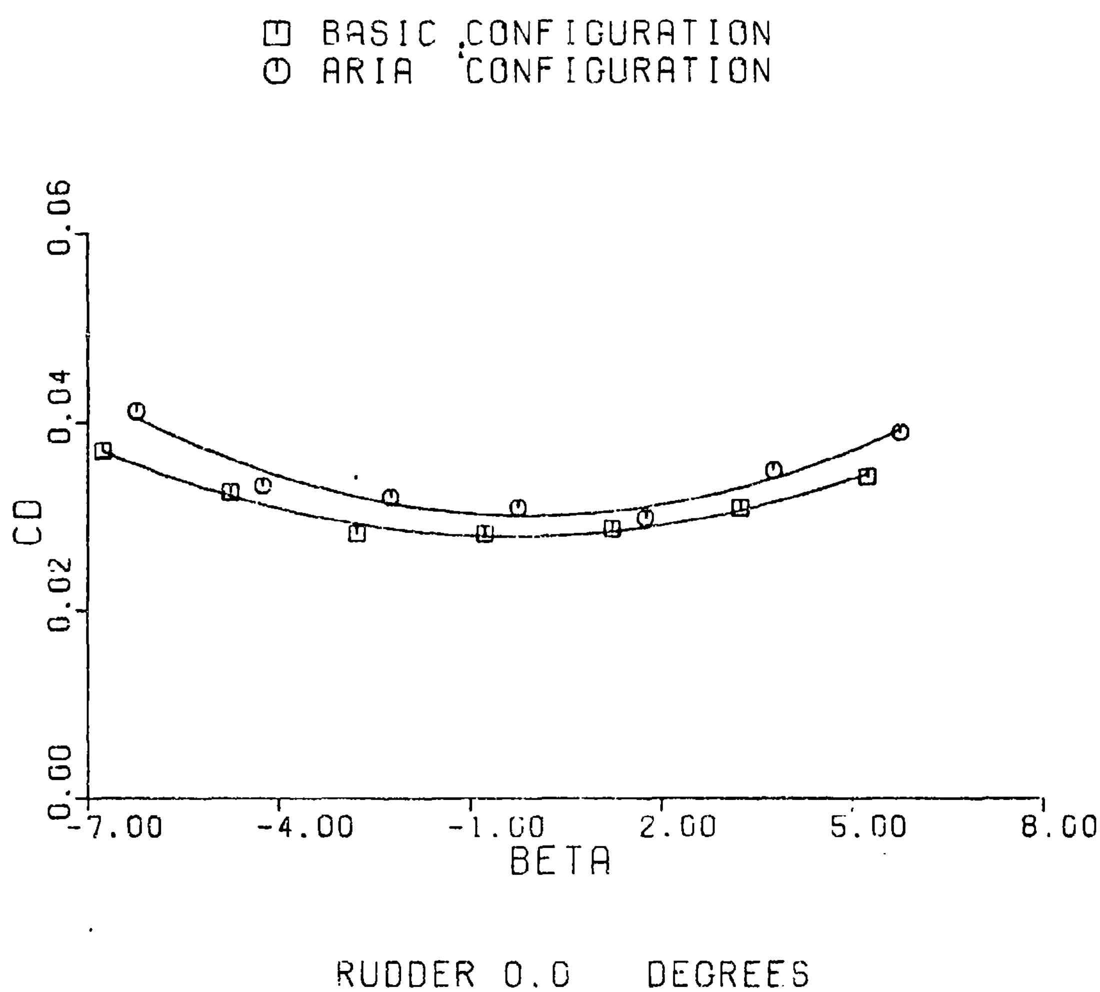


Fig. D-25. C_D vs β, Rudder 0.0 Degrees

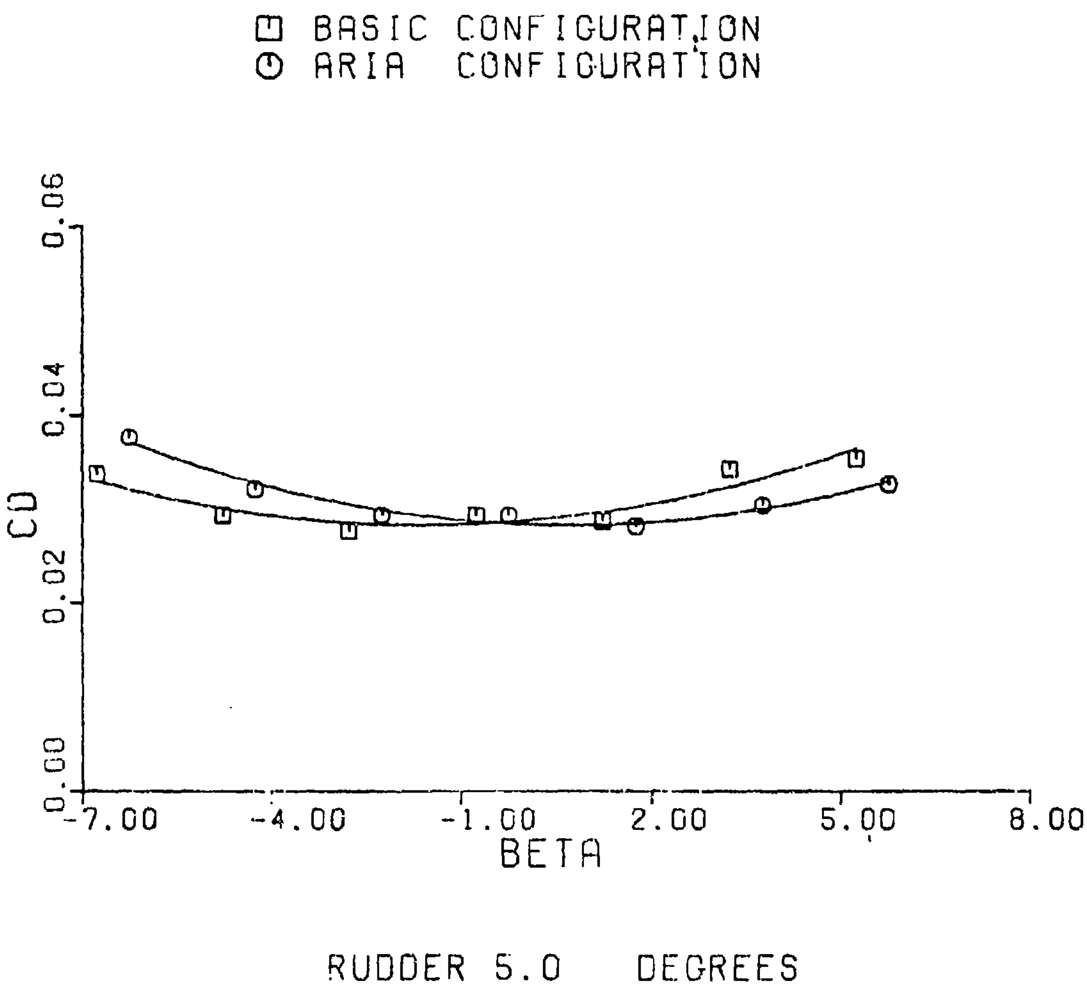


Fig. D-26. C_D vs β, Rudder 5.0 Degrees

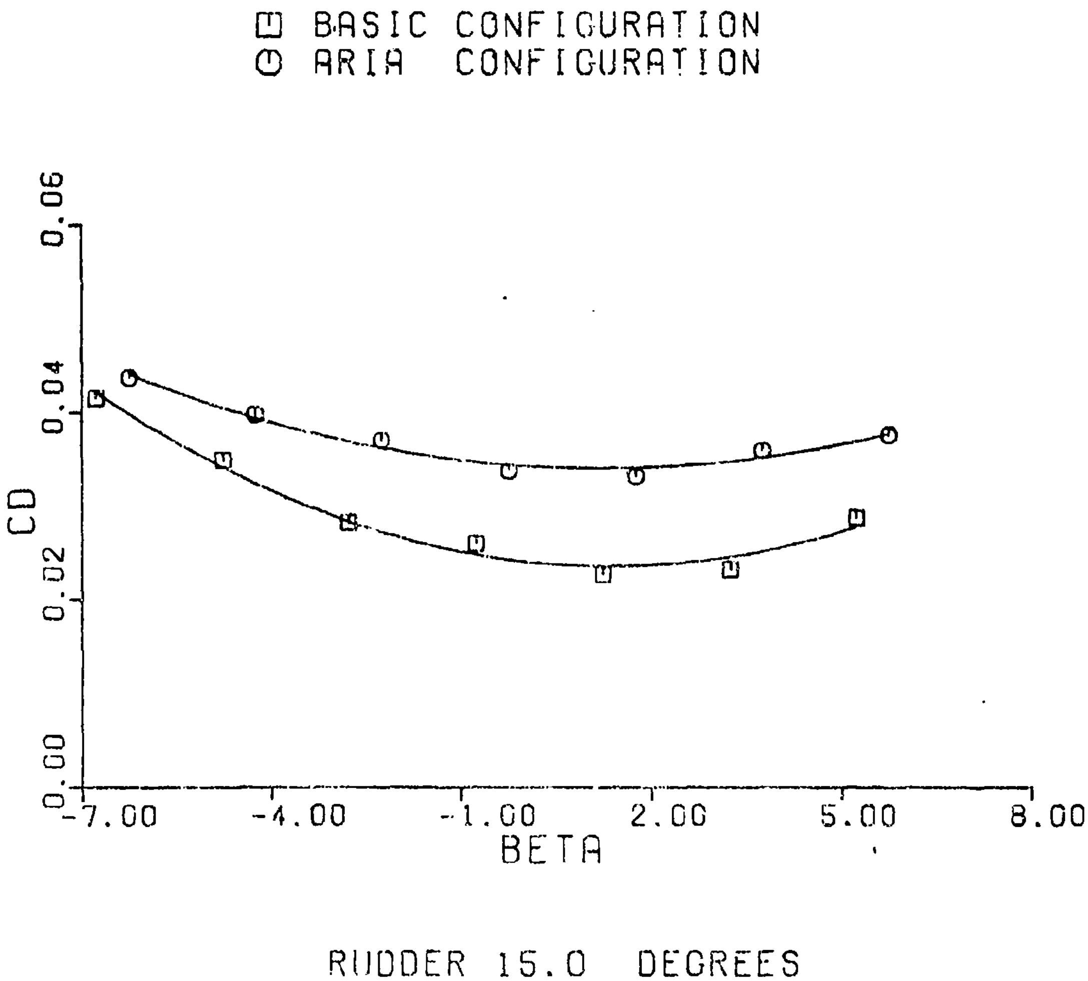


Fig. D-27. C_D vs β, Rudder 15.0 Degrees

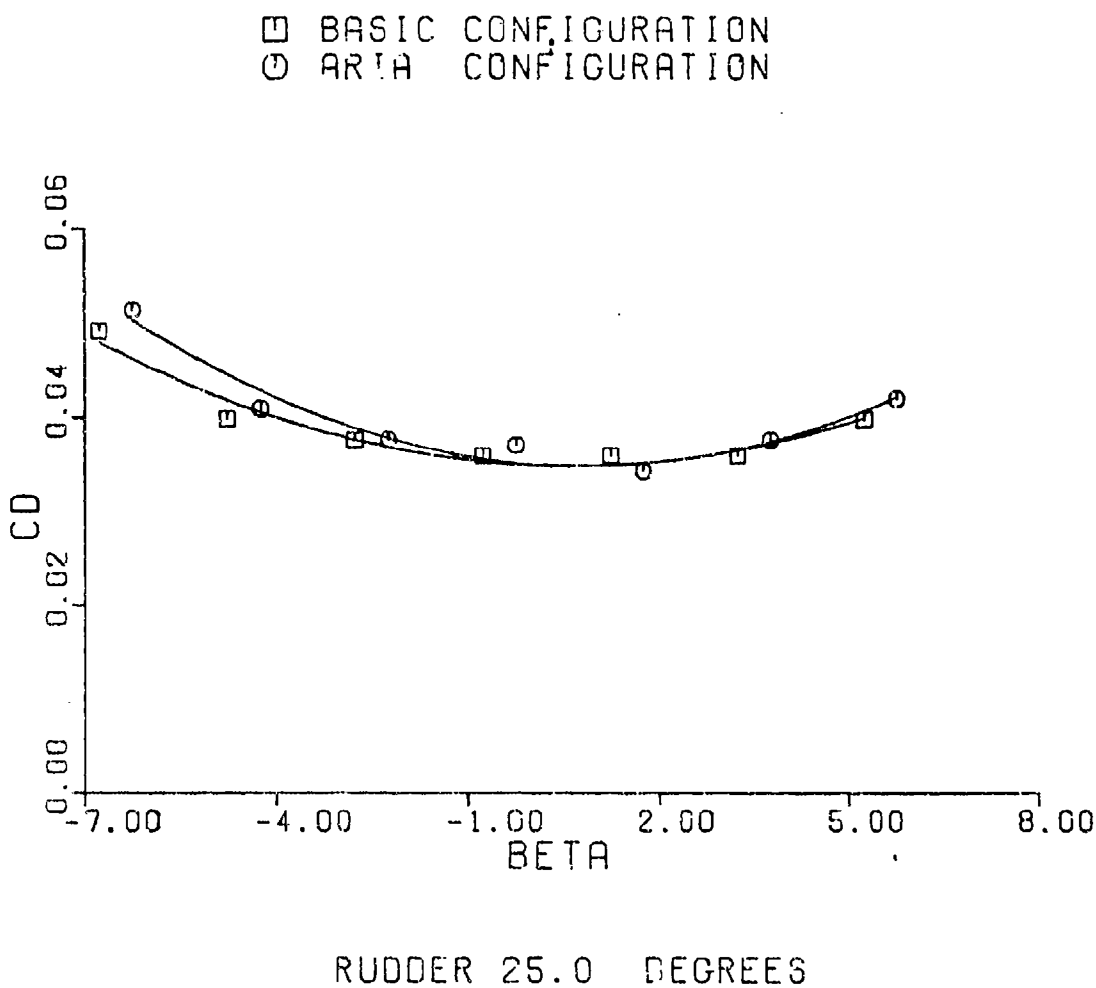


Fig. D-28. C_D vs β, Rudder 25.0 Degrees

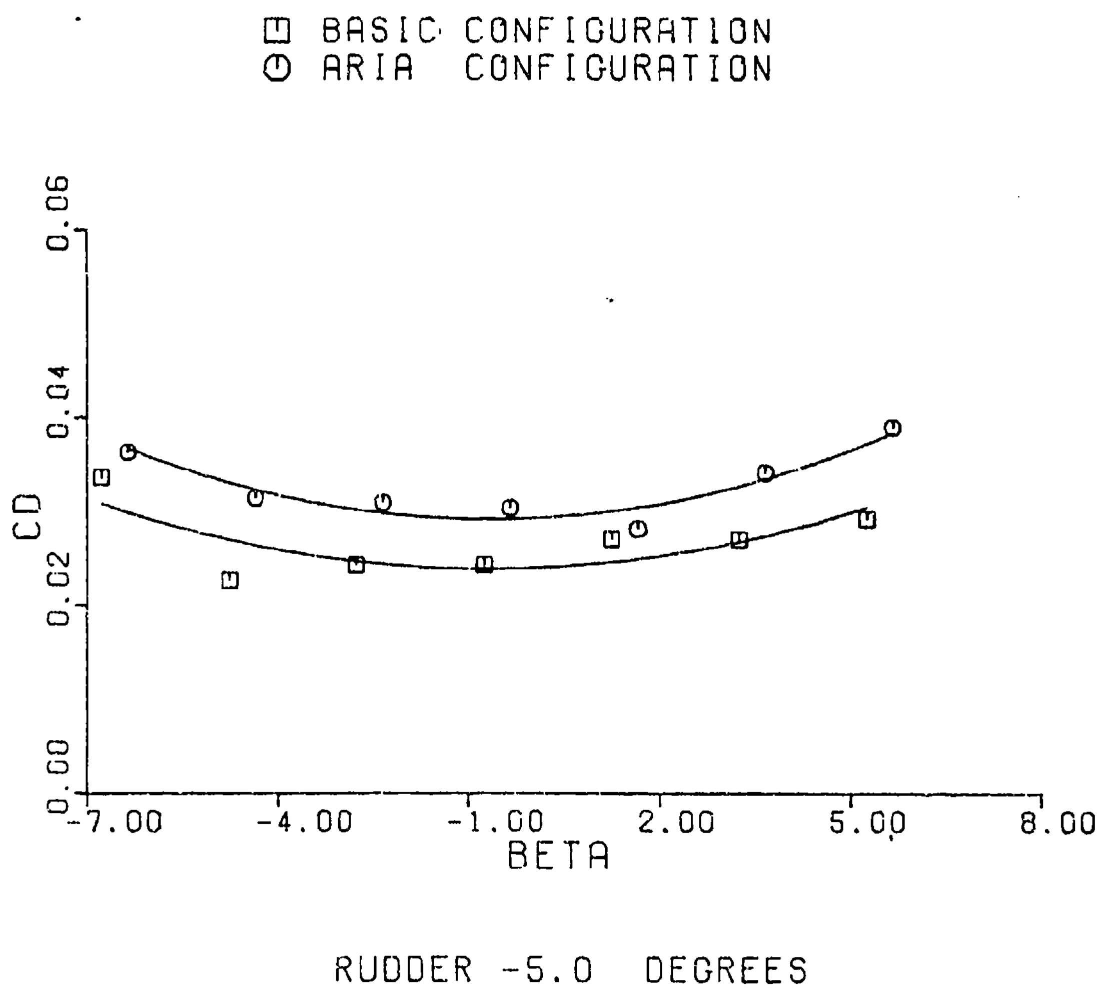


Fig. D-29. C_D vs β, Rudder -5.0 Degrees

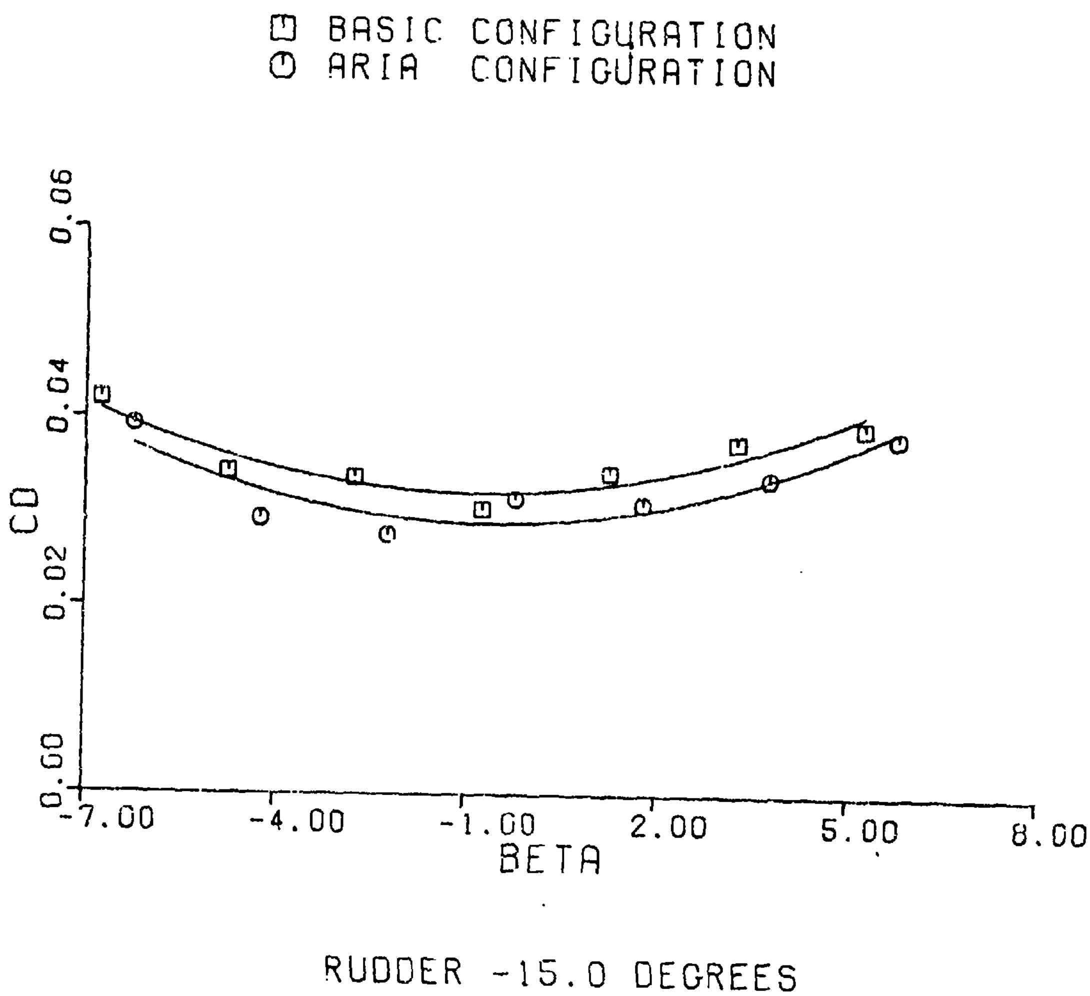


Fig. D-30. C_D vs β, Rudder -15.0 Degrees

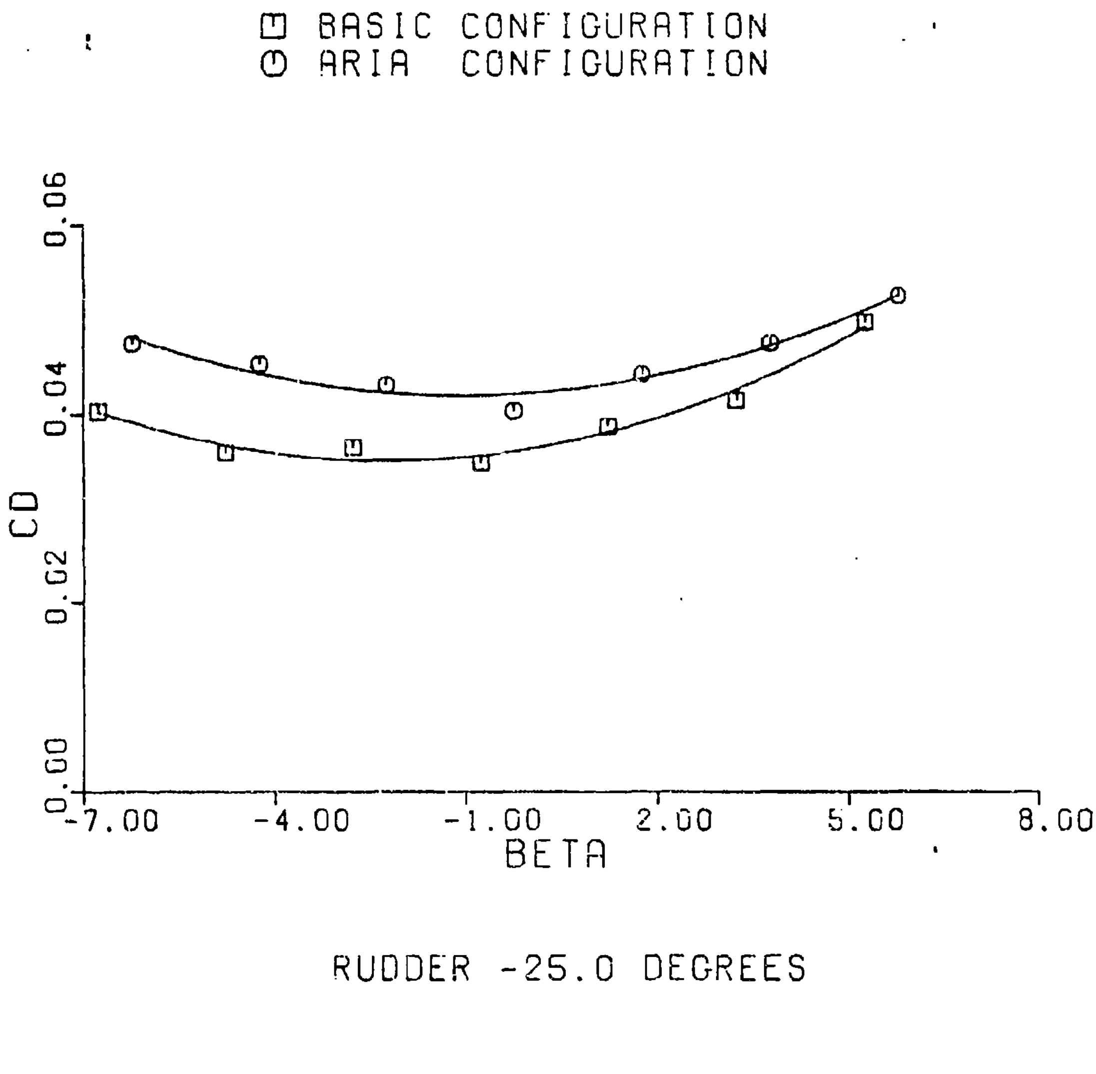


Fig. D-31. C_D vs β, Rudder -25.0 Degrees

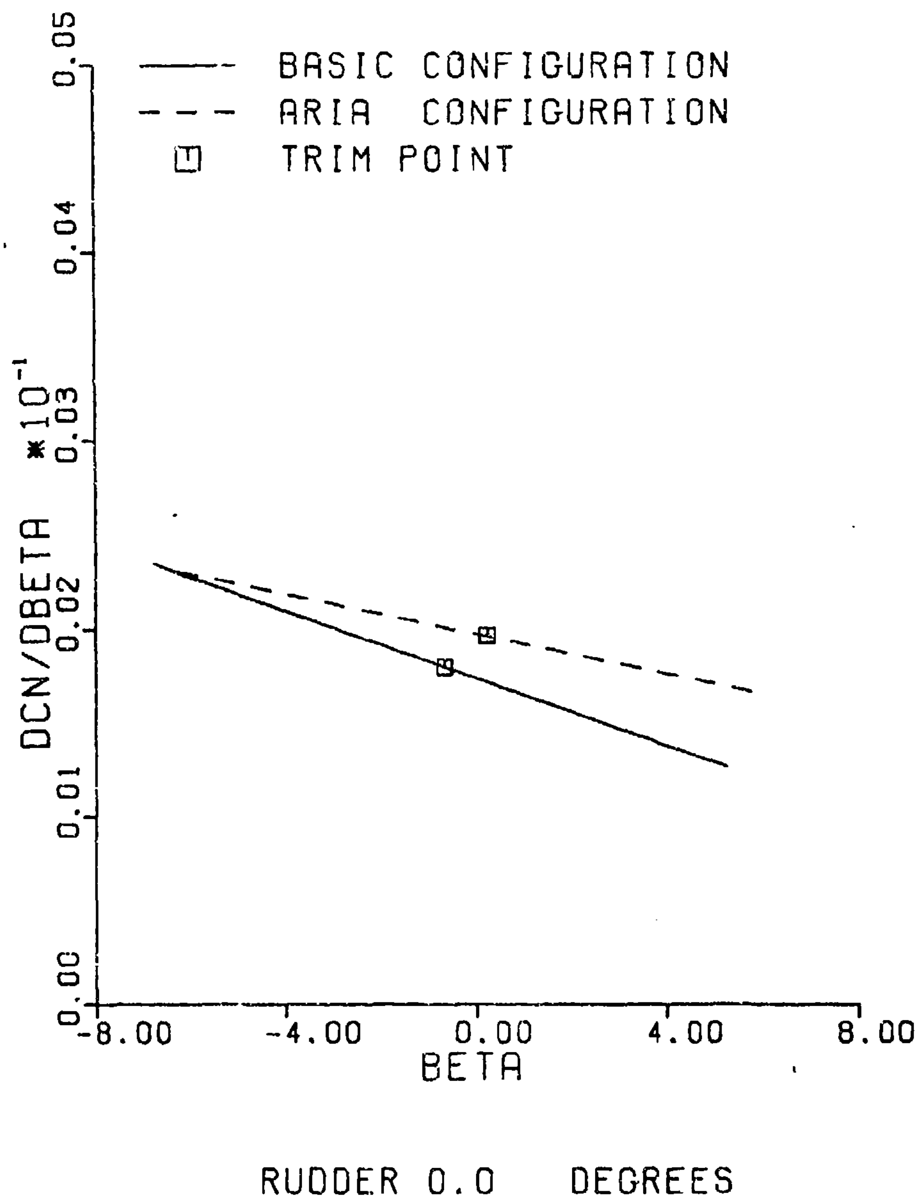


Fig. D-32. $dC_N/d\beta$ vs β, Rudder 0.0 Degrees

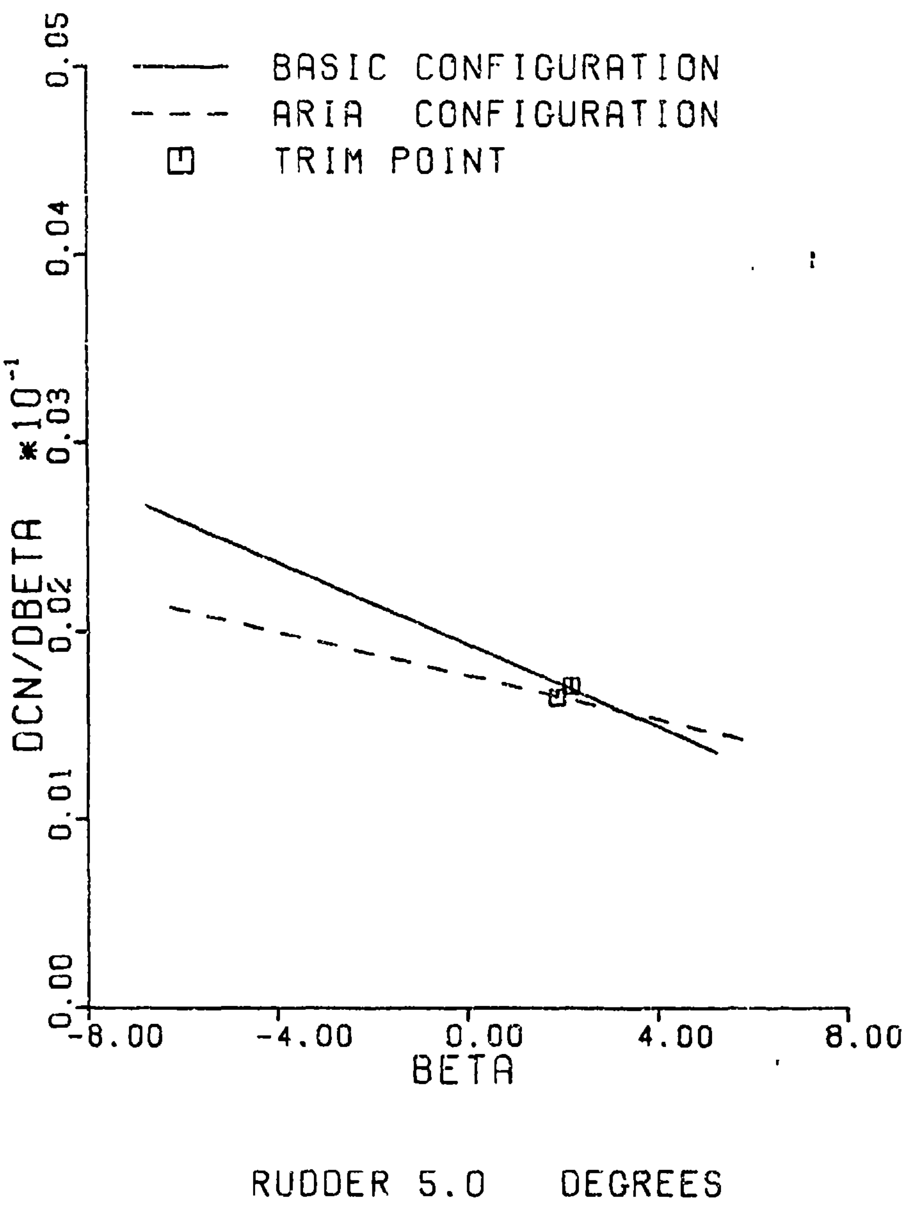
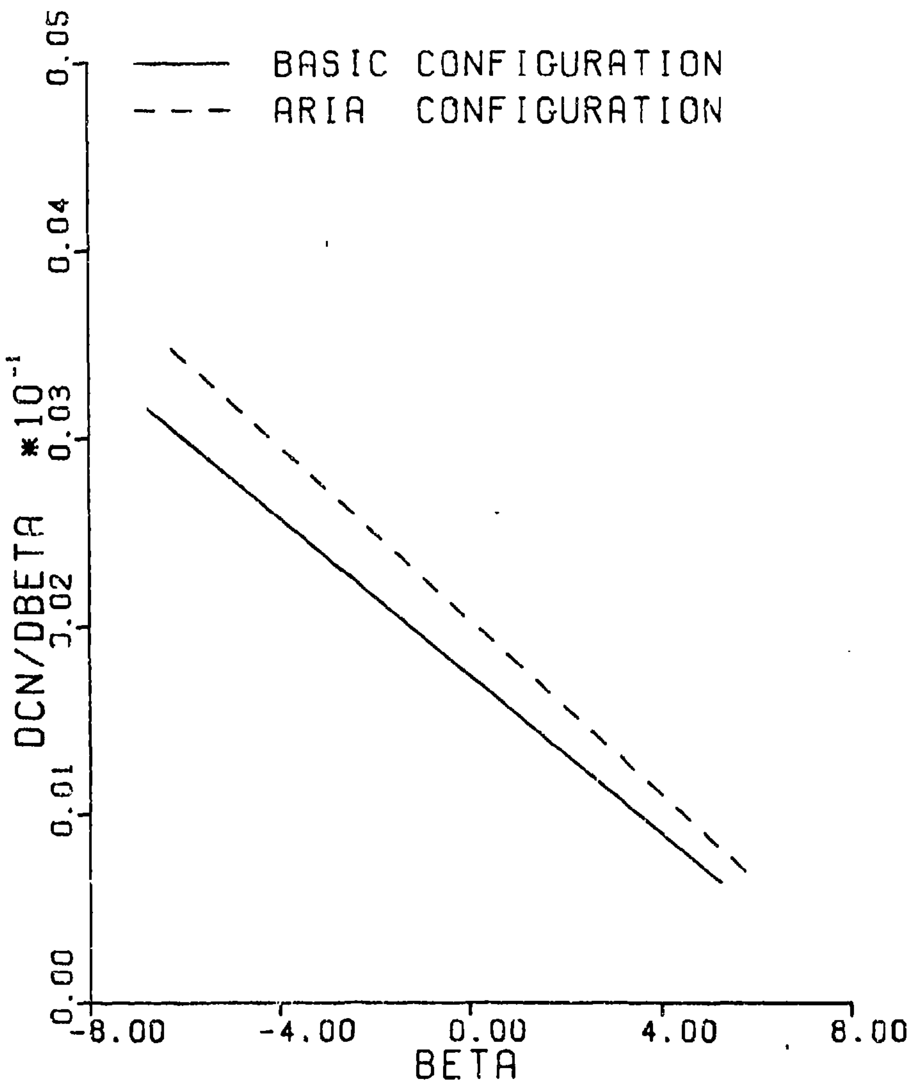


Fig. D-33. $dC_N/d\beta$ vs β, Rudder 5.0 Degrees



RUDDER 15.0 DEGREES

Fig. D-34. $dC_N/d\beta$ vs β, Rudder 15.0 Degrees

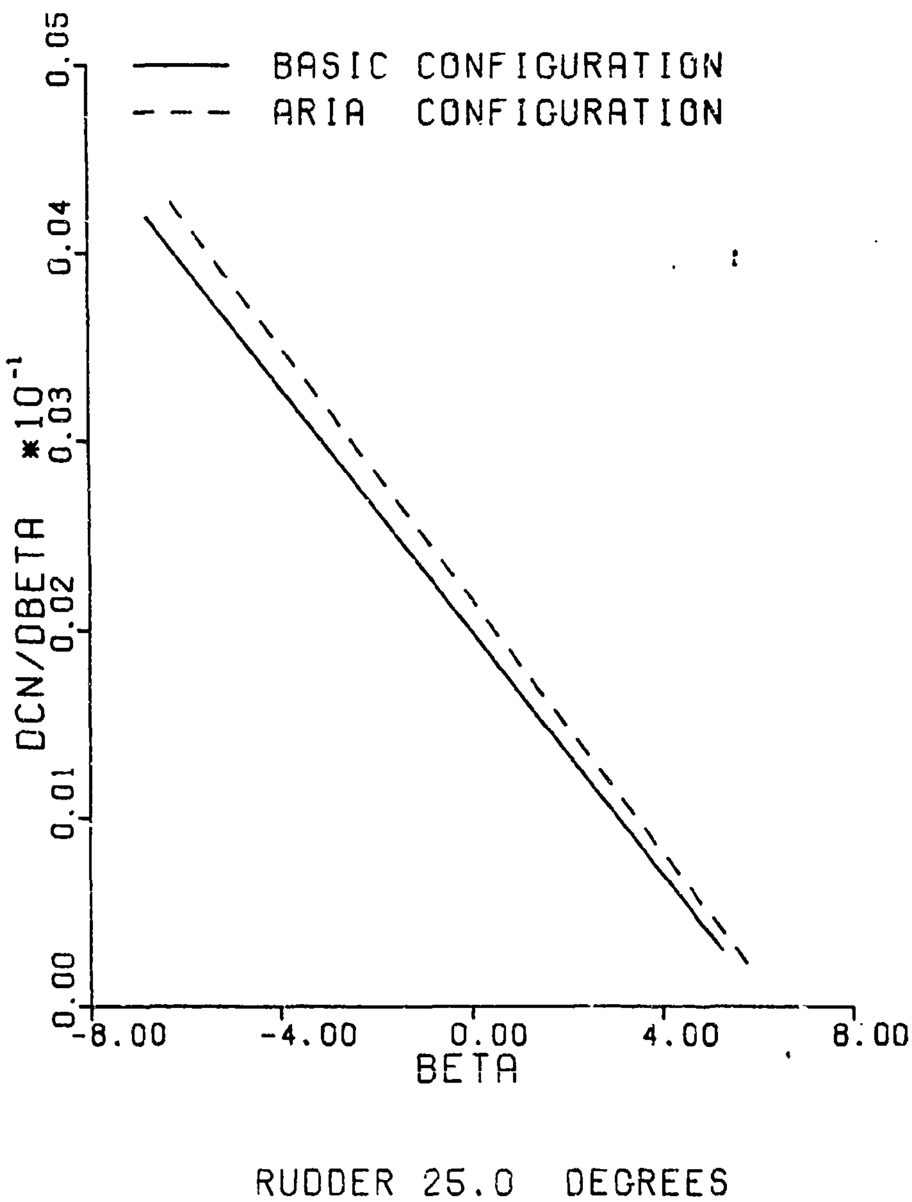


Fig. D-35. $dC_N/d\beta$ vs β, Rudder 25.0 Degrees

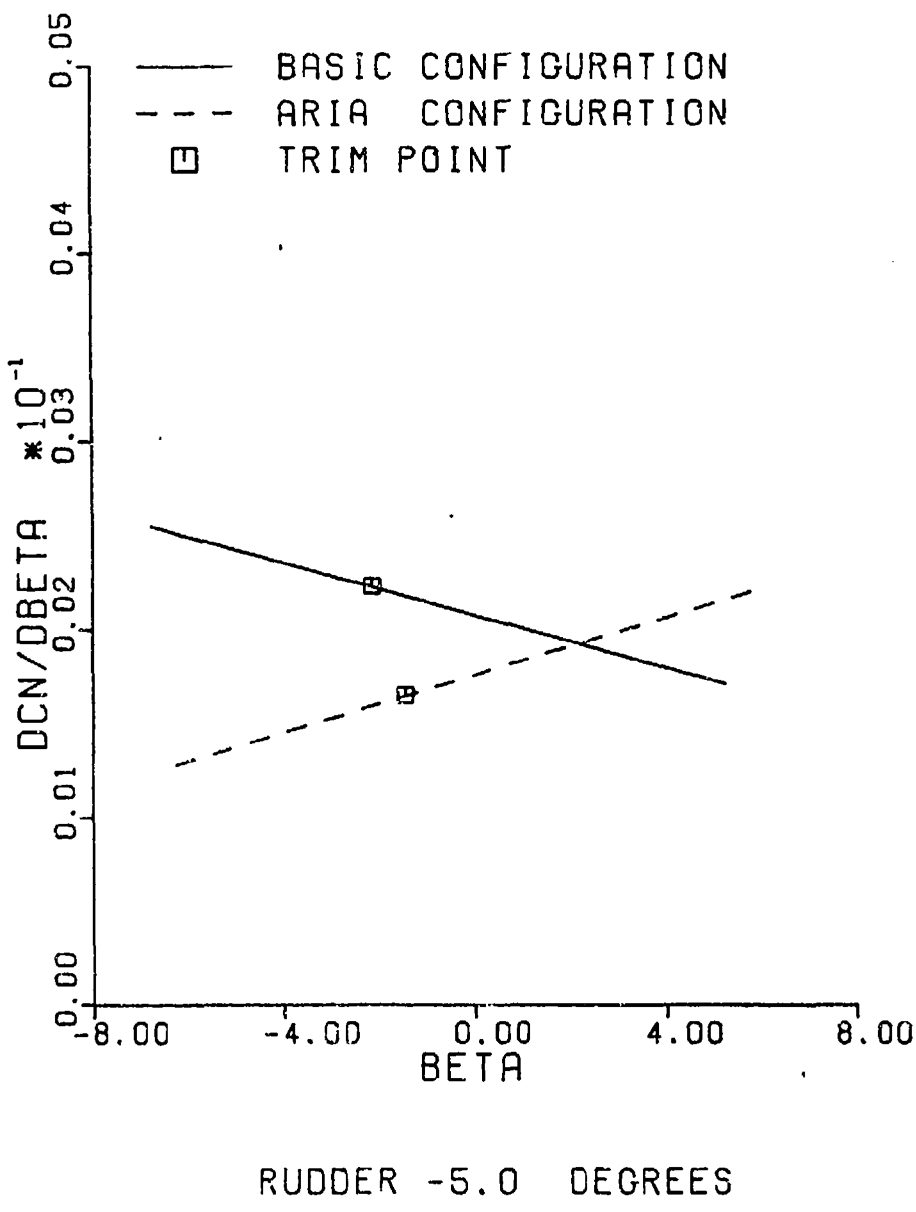


Fig. D-36. $dC_N/d\beta$ vs β, Rudder -5.0 Degrees

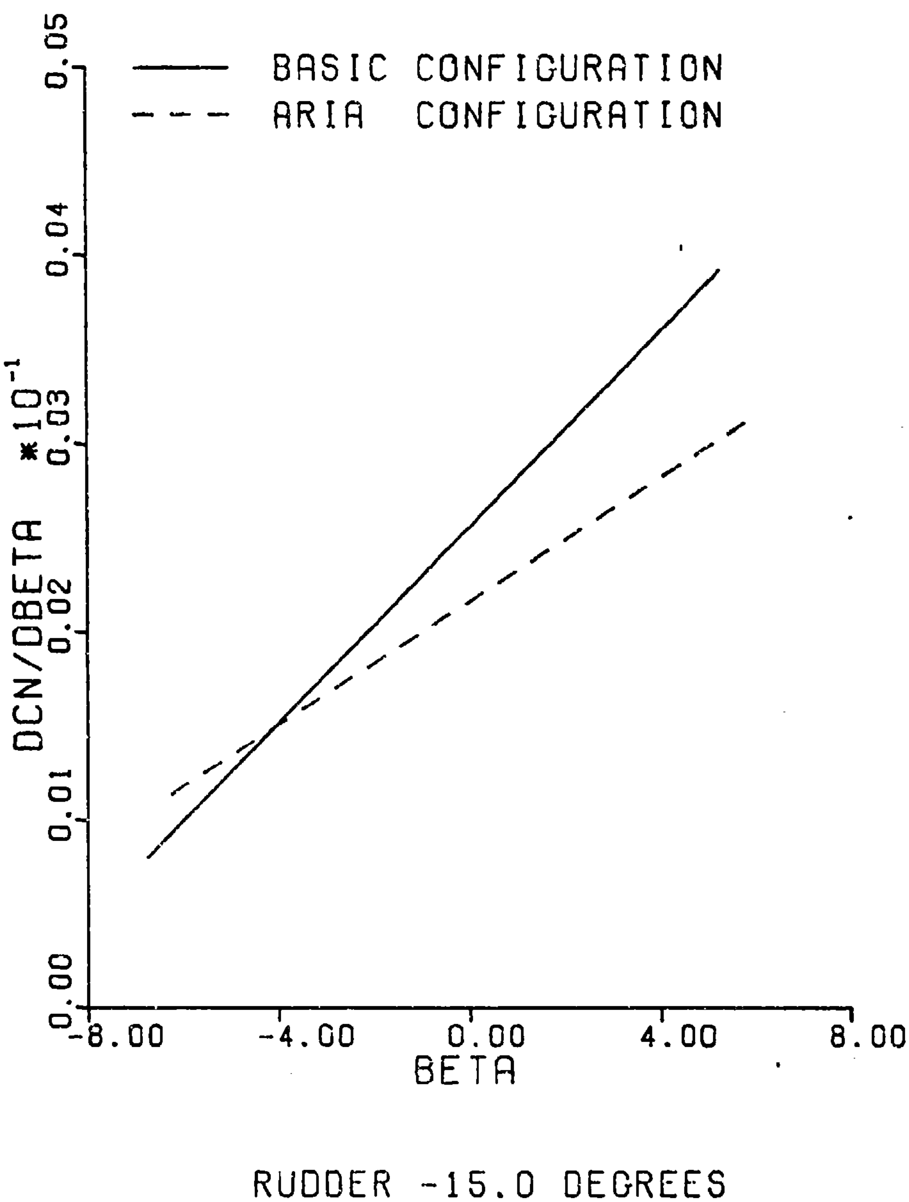


Fig. D-37. $dC_N/d\beta$ vs β, Rudder -15.0 Degrees

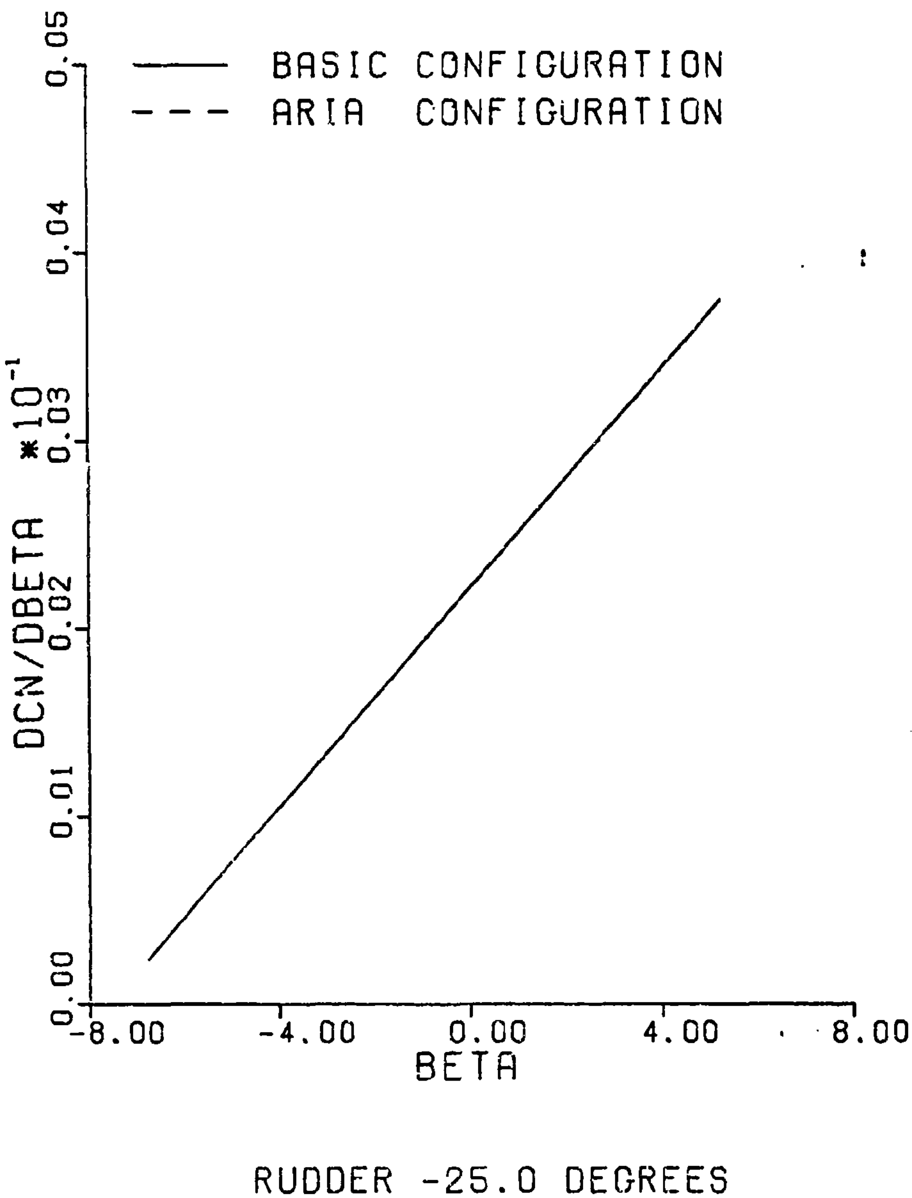


Fig. D-38. $dC_N/d\beta$ vs β, Rudder -25.0 Degrees

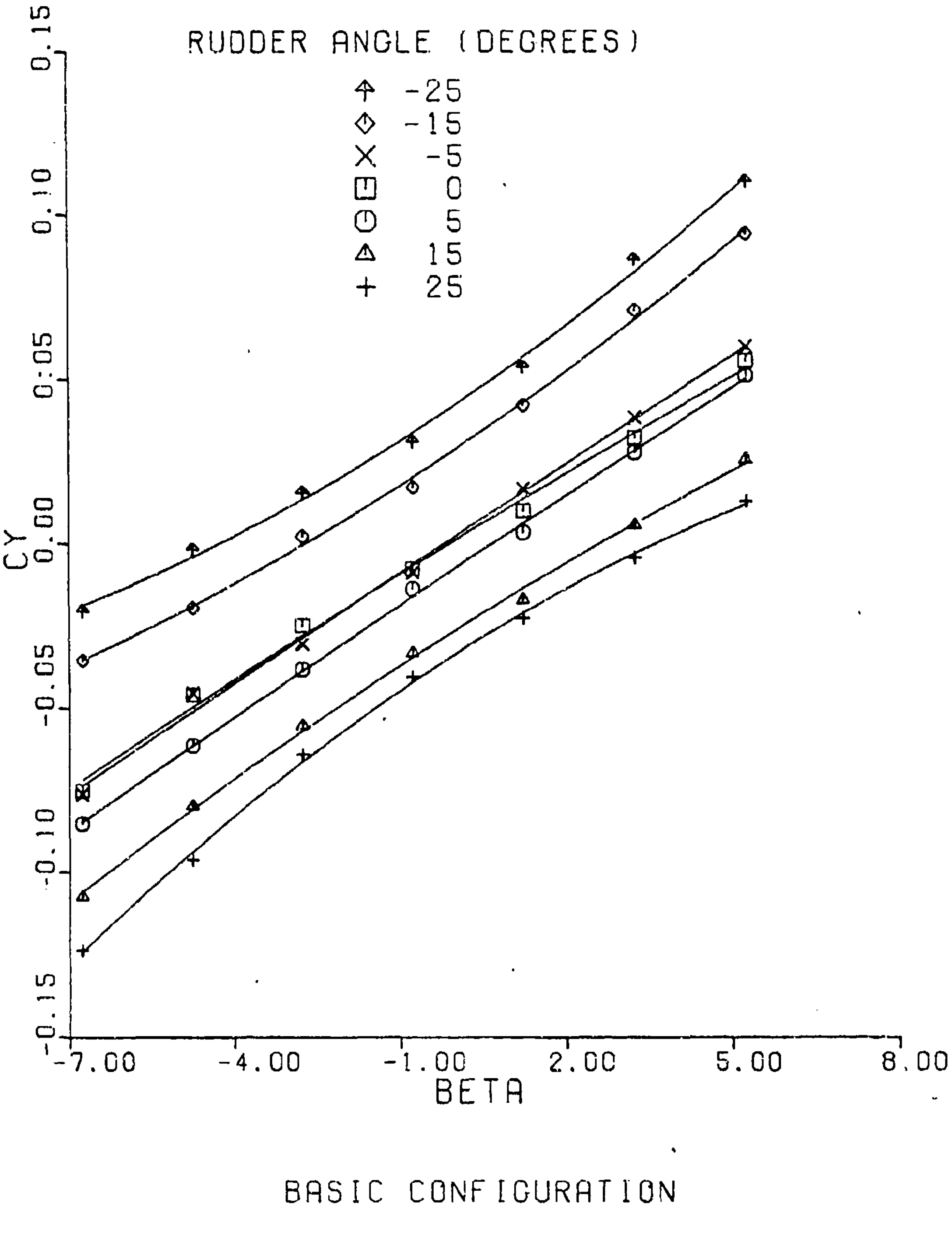


Fig. D-39. C_Y vs β, BASIC Configuration

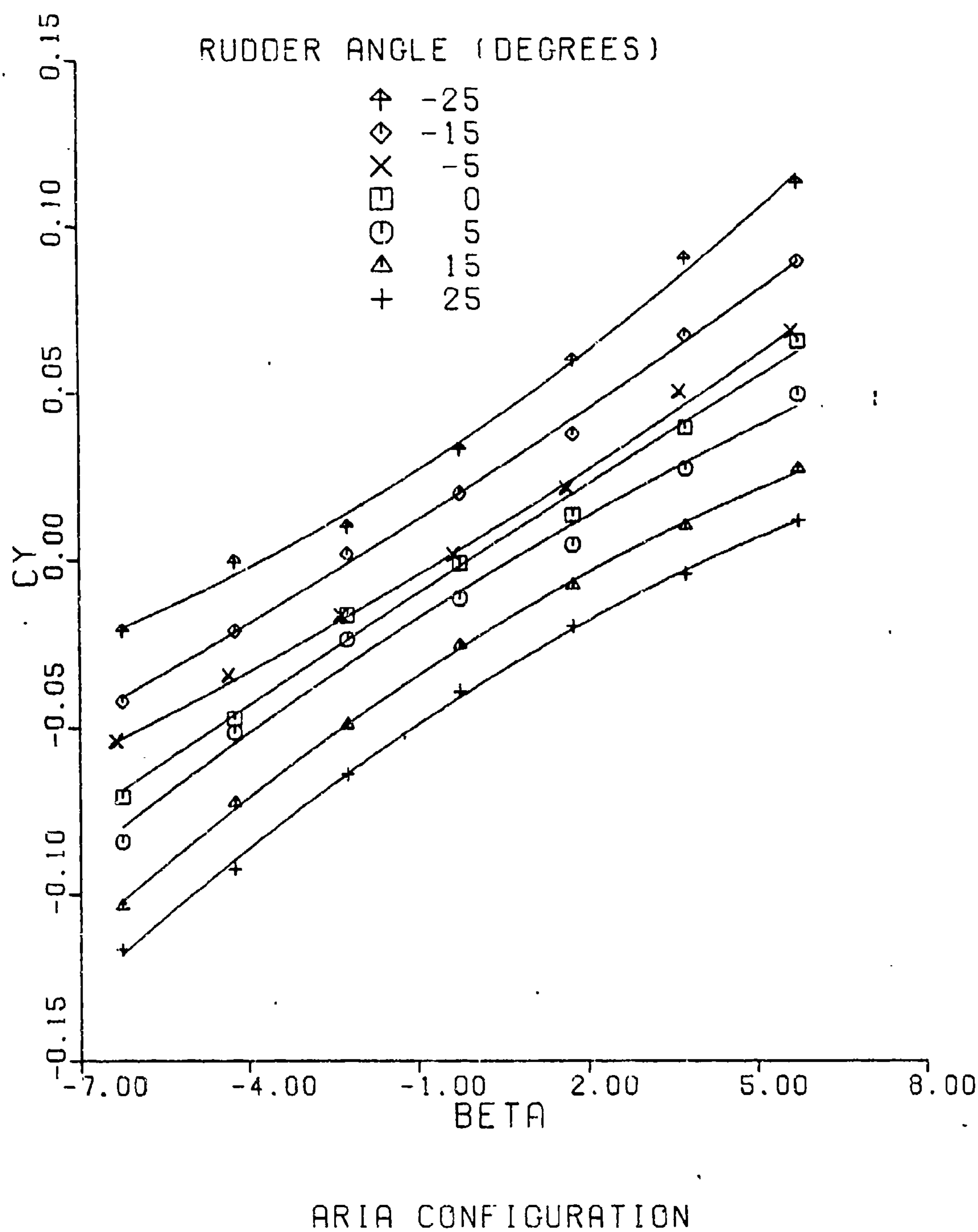


Fig. D-40. C_Y vs β, BASIC Configuration

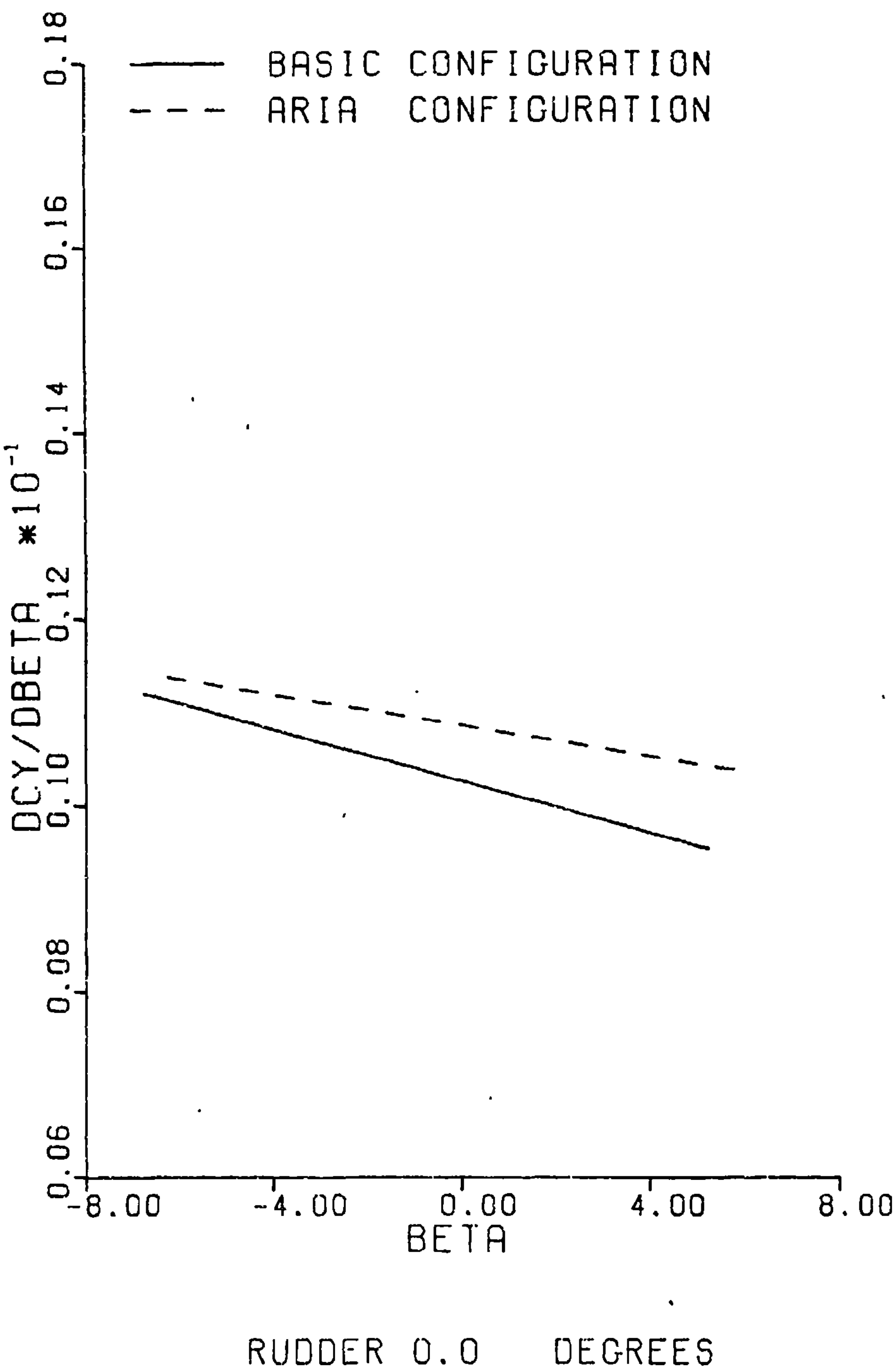


Fig. D-41. $dC_Y/d\beta$ vs β, Rudder 0.0 Degrees

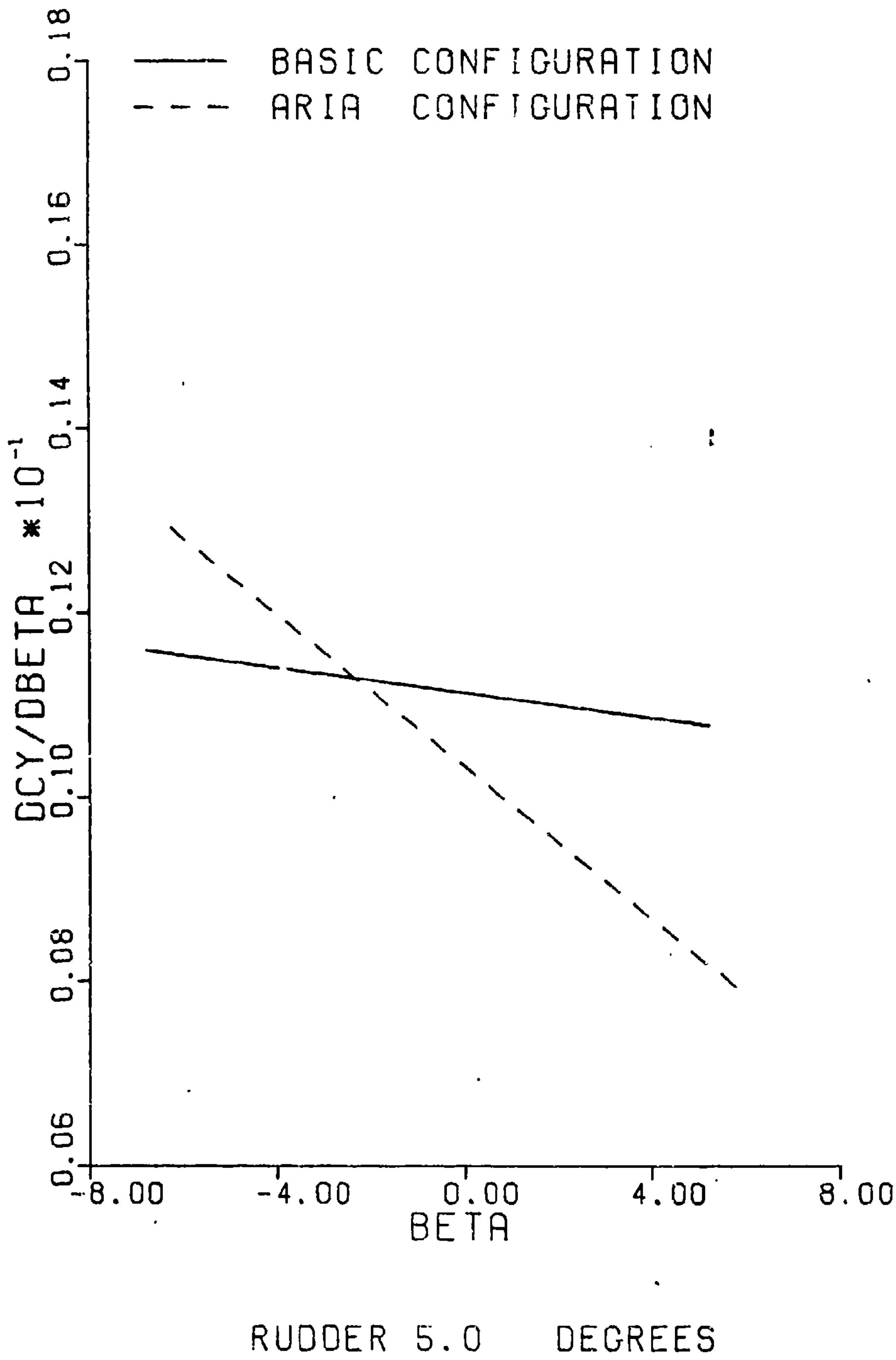


Fig. D-42. $dC_Y/d\beta$ vs β, Rudder 5.0 Degrees

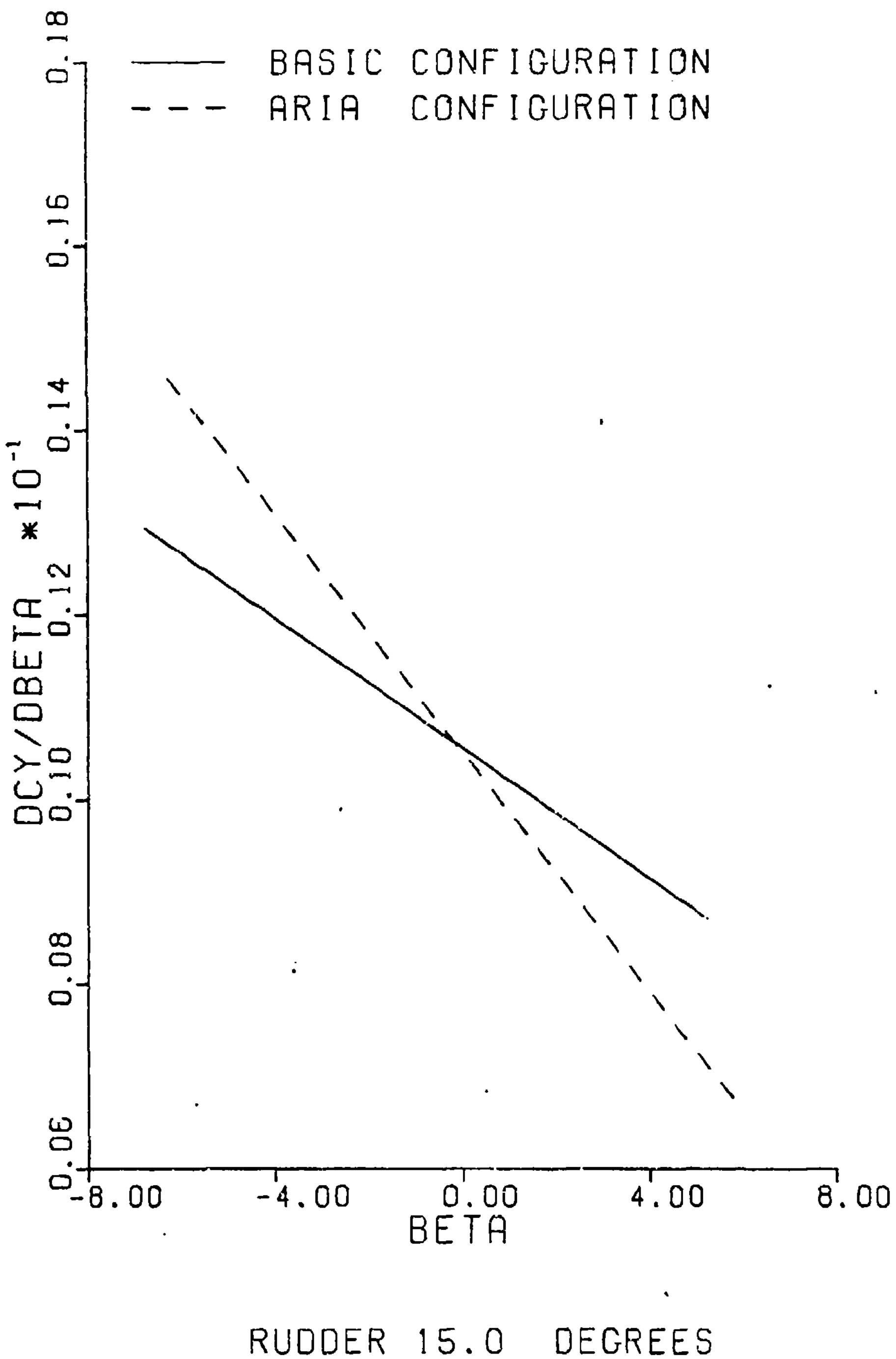


Fig. D-43. $dC_Y/d\beta$ vs β, Rudder 15.0 Degrees

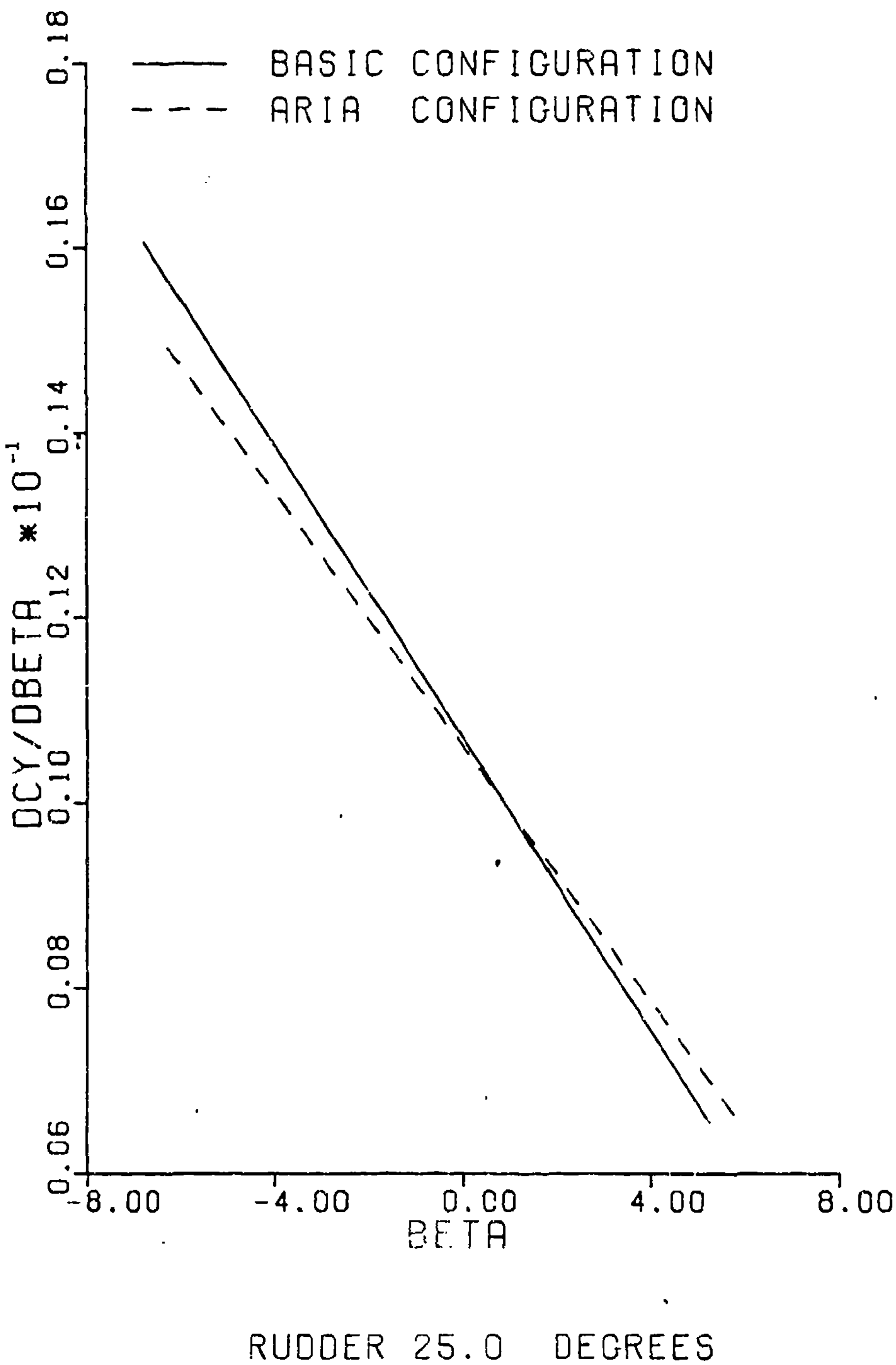


Fig. D-44. $dC_Y/d\beta$ vs β, Rudder 25.0 Degrees

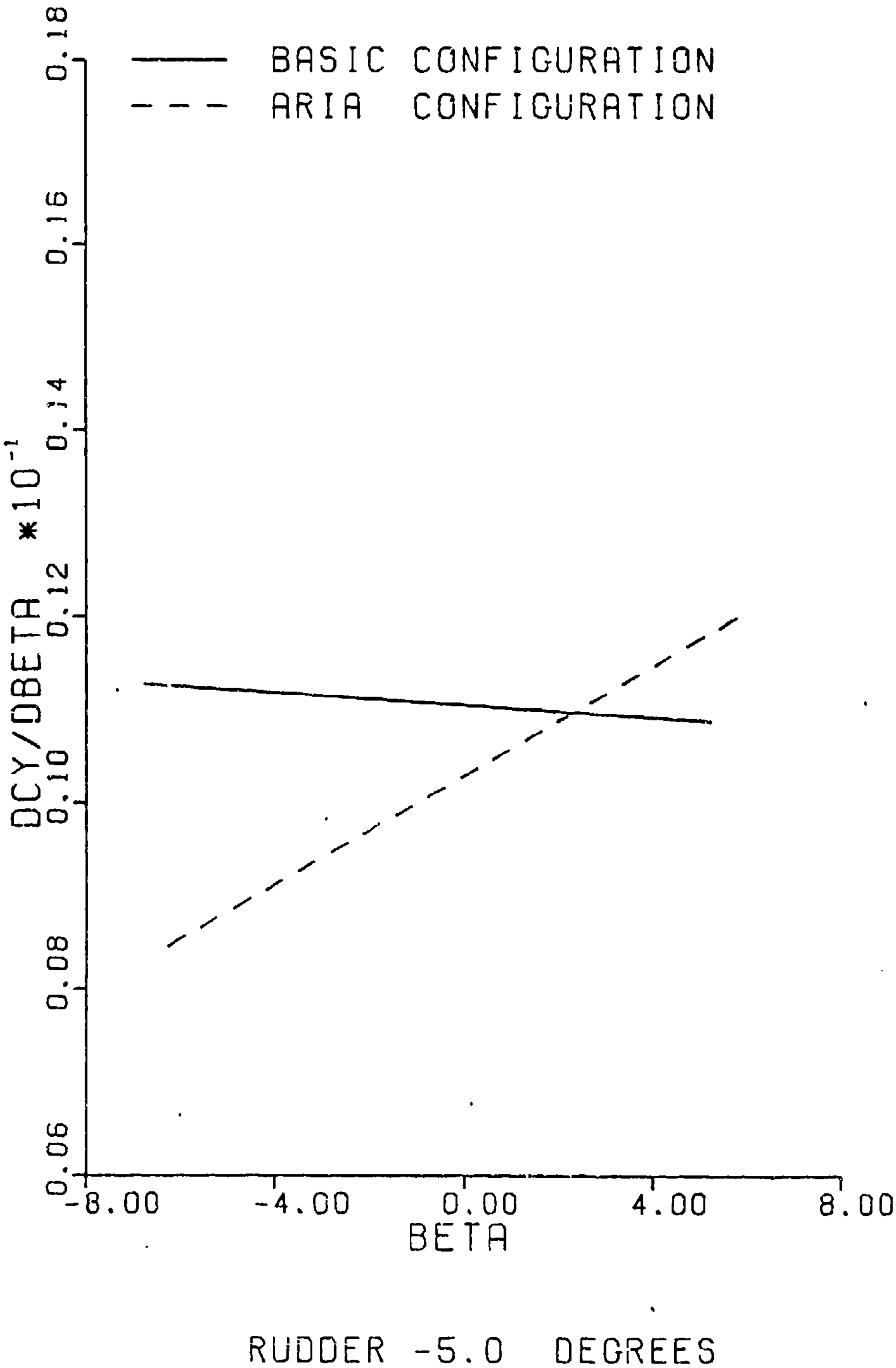


Fig. D-45. $dC_Y/d\beta$ vs β, Rudder -5.0 Degrees

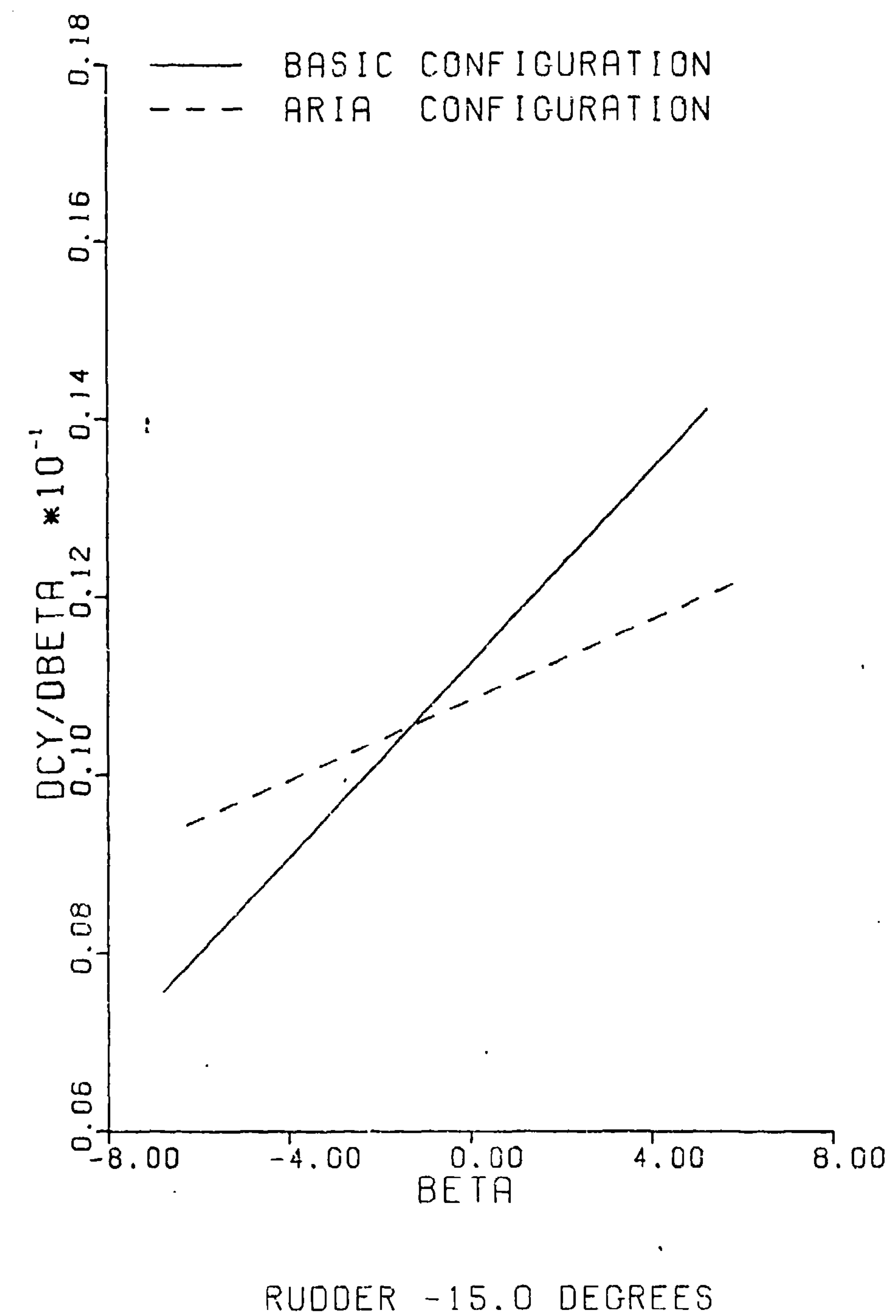


Fig. D-46. $dC_Y/d\beta$ vs β, Rudder -15.0 Degrees

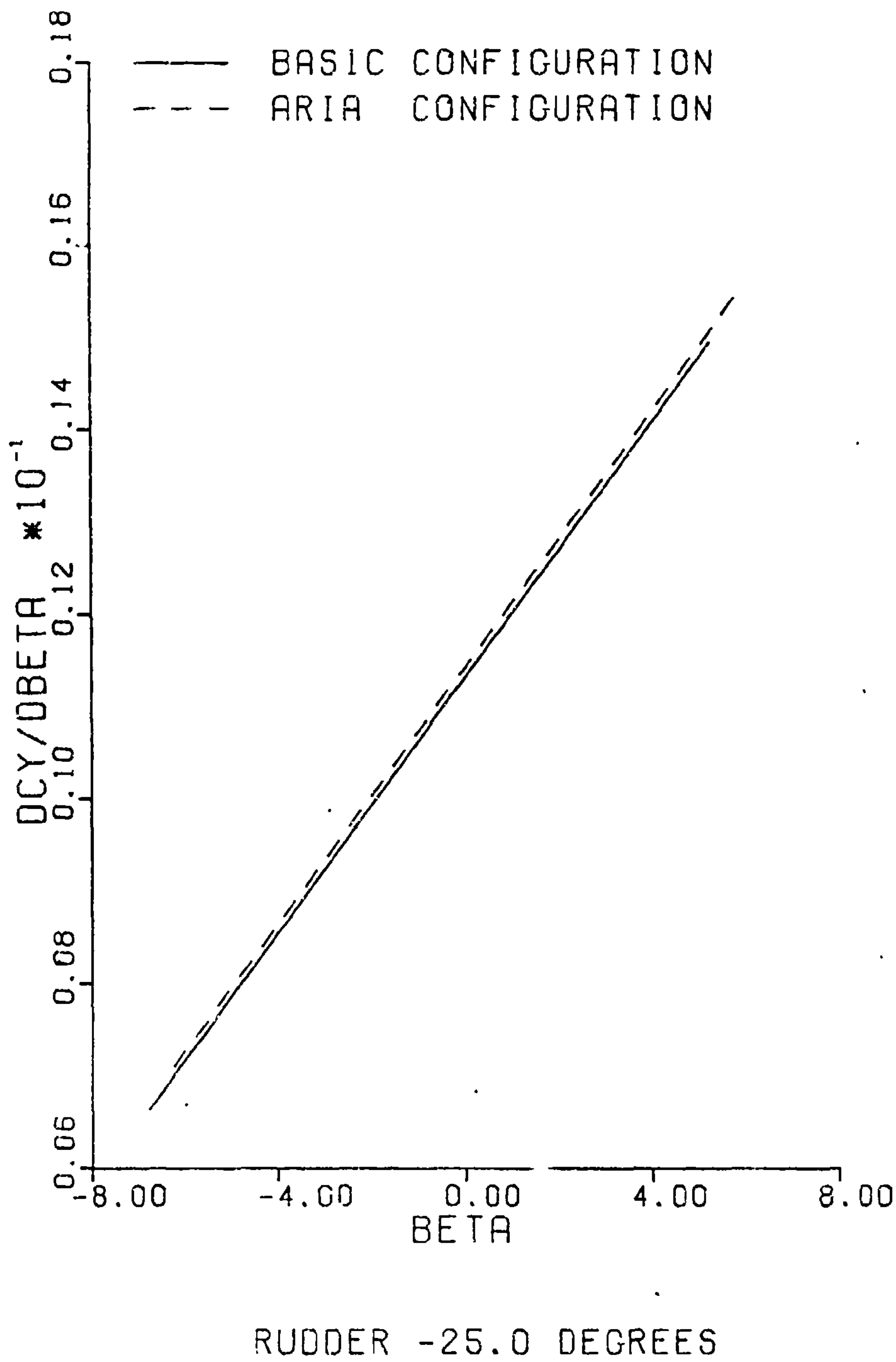


Fig. D-47. $dC_Y/d\beta$ vs β, Rudder -25.0 Degrees

APPENDIX E

Tabular Test Results

This Appendix contains computer listings from the data reduction programs. Included are the polynomial coefficients corresponding to the appropriate least square data fit. The polynomials are of the following form:

$$y = A1 + A2X + A3X^2 + \text{------} + ANX^{N-1}$$

LIST OF SYMBOLS

Computer Symbol	Thesis Symbol
AOA	α
CD	C_D
CL	C_L
CL**2	C_L^2
CLALPHA	C_{L_α}
CM	C_M
CMALPHA	C_{M_α}
CMCL	$C_{M_{C_L}}$
HN	h_n
BETA	β
CN	C_N
CNBETA	$dC_N/d\beta$
CY	C_Y
CYBETA	$dC_Y/d\beta$

STABILIZER 7.0 DEGREES RUDDER 0.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.79	-0.069	-0.188	0.029	0.035
-2.76	-0.124	-0.013	0.027	0.000
-0.74	-0.169	0.140	0.026	0.020
1.28	-0.203	0.309	0.029	0.095
3.30	-0.232	0.449	0.035	0.202
5.32	-0.260	0.583	0.054	0.339
7.33	-0.269	0.707	0.074	0.500
9.35	-0.290	0.823	0.117	0.678
10.36	-0.297	0.869	0.138	0.755
11.36	-0.306	0.913	0.157	0.833
12.37	-0.309	0.940	0.186	0.884
13.37	-0.319	0.966	0.221	0.934
14.37	-0.338	0.989	0.241	0.978
15.37	-0.362	1.002	0.272	1.004
16.37	-0.376	1.002	0.304	1.004
17.37	-0.376	0.993	0.321	0.965

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.79	-0.066	-0.188	0.029	0.035
-2.76	-0.125	-0.015	0.026	0.000
-0.74	-0.171	0.147	0.026	0.022
1.28	-0.206	0.302	0.029	0.091
3.30	-0.232	0.448	0.036	0.201
5.32	-0.253	0.586	0.052	0.343
7.33	-0.270	0.711	0.077	0.505
9.35	-0.267	0.820	0.114	0.673
10.36	-0.295	0.867	0.136	0.752
11.36	-0.305	0.908	0.151	0.825
12.37	-0.315	0.943	0.168	0.889
13.37	-0.326	0.970	0.216	0.941
14.37	-0.340	0.989	0.245	0.979
15.37	-0.355	1.000	0.273	1.000
16.37	0.000	1.002	0.300	1.003
17.37	0.000	0.993	0.322	0.986

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	-0.185E+00	0.205E+00	0.263E-01	-0.178E-01	0.769E-01
A2	-0.178E-01	0.769E-01	0.107E-02	0.242E-02	-0.183E-02
A3	0.121E-02	-0.913E-03	0.445E-03	-0.150E-03	0.262E-04
A4	-0.500E-04	0.872E-05	0.591E-04	0.000E+01	-0.169E-05
A5	0.000E+01	-0.472E-05	0.261E-05	0.000E+01	0.353E-06
A6	0.000E+01	0.706E-07	-0.189E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.79	-0.0329	0.0885
-2.76	-0.0257	0.0826
-0.74	-0.0197	0.0783
1.28	-0.0150	0.0746
3.30	-0.0115	0.0705
5.32	-0.0092	0.0654
7.33	-0.0081	0.0585
9.35	-0.0083	0.0494
10.36	-0.0089	0.0439
11.36	-0.0097	0.0378
12.37	-0.0108	0.0309
13.37	-0.0123	0.0234
14.37	-0.0140	0.0151
15.37	-0.0161	0.0062

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CL, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.188	-0.072	0.028	0.031	0.020	0.021
-0.013	-0.123	0.032	0.024	0.095	0.029
0.140	-0.163	0.020	0.023	0.202	0.040
0.309	-0.203	0.026	0.029	0.339	0.055
0.449	-0.232	0.042	0.040	0.500	0.071
0.583	-0.257	0.057	0.054	0.000	0.000
0.707	-0.277	0.072	0.072	0.000	0.000
0.823	-0.294	0.105	0.000	0.000	0.000
0.869	-0.300	0.131	0.000	0.000	0.000
0.913	-0.305	0.167	0.000	0.000	0.000
0.940	-0.309	0.197	0.000	0.000	0.000
0.966	-0.312	0.231	0.000	0.000	0.000
0.989	0.000	0.267	0.000	0.000	0.000
1.002	0.000	0.290	0.000	0.000	0.000
1.002	0.000	0.291	0.000	0.000	0.000
0.993	0.000	0.273	0.000	0.000	0.000

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	-0.126E+00	0.304E-01	0.233E-01	0.195E-01
A2	-0.272E+00	-0.102E+00	-0.195E-01	0.104E+00
A3	0.836E-01	-0.622E-01	0.125E+00	0.000E+01
A4	0.000E+01	0.215E+01	0.000E+01	0.000E+01
A5	0.000E+01	-0.432E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.257E+01	0.000E+01	0.000E+01

CL	CMCL	[illegible]
-0.188	-0.3037	0.5537
-0.013	-0.2744	0.5244
0.140	-0.2489	0.4999
0.309	-0.2206	0.4756
0.449	-0.1972	0.4472
0.583	-0.1709	0.4249
0.707	-0.1541	0.4041
0.823	-0.1346	0.3846
0.869	-0.1271	0.3771
0.913	-0.1197	0.3697
0.940	-0.1151	0.3651
0.966	-0.1107	0.3607

STABILIZER 7.0 DEGREES RUDDER 0.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.27	-0.057	-0.208	0.031	0.043
-2.24	-0.138	-0.024	0.029	0.001
-0.22	-0.153	0.125	0.029	0.016
1.80	-0.202	0.290	0.037	0.084
3.82	-0.213	0.431	0.045	0.186
5.84	-0.234	0.567	0.061	0.322
7.85	-0.286	0.701	0.077	0.491
9.87	-0.277	0.814	0.117	0.663
10.88	-0.280	0.866	0.138	0.750
11.88	-0.289	0.909	0.156	0.827
12.89	-0.292	0.935	0.184	0.871
13.89	-0.347	0.974	0.216	0.949
14.89	-0.324	0.988	0.239	0.975
15.89	-0.353	1.006	0.269	1.012
16.90	-0.385	1.019	0.301	1.039
17.89	-0.313	0.986	0.311	0.973

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.27	-0.064	-0.206	0.031	0.042
-2.24	-0.121	-0.030	0.027	0.001
-0.22	-0.164	0.133	0.031	0.018
1.80	-0.197	0.266	0.037	0.072
3.82	-0.223	0.432	0.046	0.187
5.84	-0.243	0.570	0.059	0.325
7.85	-0.260	0.699	0.081	0.488
9.87	-0.277	0.813	0.114	0.660
10.88	-0.286	0.862	0.135	0.744
11.88	-0.296	0.906	0.159	0.822
12.89	-0.307	0.944	0.186	0.891
13.89	-0.320	0.973	0.214	0.947
14.89	-0.335	0.994	0.243	0.988
15.89	-0.351	1.005	0.270	1.011
16.90	0.000	1.035	0.295	1.011
17.89	0.000	0.994	0.313	0.9[illegible]

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CY/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPLHA/AOA
A1	-0.168E+00	0.150E+00	0.314E-01	-0.182E-01	0.774E-01
A2	-0.182E-01	0.774E-01	0.271E-02	0.247E-02	-0.209E-02
A3	0.123E-02	-0.105E-02	0.268E-03	-0.153E-03	0.172E-03
A4	-0.512E-04	0.572E-04	-0.322E-04	0.000E+01	-0.251E-04
A5	0.000E+01	-0.629E-05	0.103E-04	0.000E+01	0.303E-06
A6	0.000E+01	0.606E-07	-0.395E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.27	-0.0315	0.0915
-2.24	-0.0245	0.0832
-0.22	-0.0188	0.0778
1.80	-0.0143	0.0740
3.82	-0.0110	0.0706
5.84	-0.0090	0.0664
7.85	-0.0083	0.0605
9.87	-0.0088	0.0521
10.88	-0.0095	0.0468
11.88	-0.0105	0.0406
12.89	-0.0119	0.0335
13.89	-0.0135	0.0253
14.89	-0.0155	0.0161
15.89	-0.0177	0.0058

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	C[illegible]
-0.208	-0.071	0.030	0.031	0.016	0.029
-0.024	-0.119	0.031	0.028	0.084	0.03[illegible]
0.125	-0.154	0.027	0.030	0.156	0.047
0.290	-0.191	0.036	0.037	0.322	0.060
0.431	-0.220	0.049	0.047	0.491	0.078
0.567	-0.246	0.061	0.060	0.000	0.000
0.701	-0.269	0.078	0.077	0.000	0.000
0.814	-0.287	0.109	0.000	0.000	0.000
0.866	-0.295	0.136	0.000	0.000	0.000
0.909	-0.301	0.167	0.000	0.000	0.000
0.935	-0.305	0.191	0.000	0.000	0.000
0.974	-0.310	0.236	0.000	0.000	0.000
0.988	0.000	0.254	0.000	0.000	0.000
1.006	0.000	0.281	0.000	0.000	0.000
1.019	0.000	0.303	0.000	0.000	0.000
0.986	0.000	0.252	0.000	0.000	0.000

POLYNOMIAL COEFFICIENTS

COEFF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	-0.125E+00	0.298E-01	0.277E-01	0.276E-01
A2	-0.245E+00	-0.455E-01	0.284E-02	0.102E+00
A3	0.565E-01	0.106E+00	0.970E-01	0.000E+01
A4	0.000E+01	0.960E+00	0.000E+01	0.000E+01
A5	0.000E+01	-0.237E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.159E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.208	-0.2687	0.5187
-0.024	-0.2479	0.4974
0.125	-0.2311	0.4811
0.290	-0.2124	0.4624
0.431	-0.1965	0.4465
0.567	-0.1811	0.4311
0.701	-0.1660	0.4160
0.814	-0.1532	0.4032
0.866	-0.1473	0.3973
0.909	-0.1424	0.3924
0.935	-0.1395	0.38[illegible]
0.974	-0.1351	0.3851

STABILIZER 4.0 DEGREES RUDDER 0.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.79	0.018	-0.230	0.031	0.053
-2.77	-0.029	-0.056	0.027	0.003
-0.75	-0.091	0.107	0.024	0.011
1.28	-0.143	0.279	0.034	0.078
3.30	-0.169	0.419	0.038	0.176
5.31	-0.188	0.555	0.050	0.308
7.33	-0.202	0.677	0.063	0.458
9.35	-0.229	0.794	0.108	0.631
10.35	-0.234	0.847	0.130	0.717
11.36	-0.231	0.886	0.146	0.785
12.36	-0.237	0.917	0.168	0.841
13.37	-0.254	0.939	0.207	0.881
14.37	-0.272	0.962	0.231	0.926
15.37	-0.291	0.976	0.262	0.953
16.37	-0.321	0.986	0.294	0.972
17.37	-0.309	0.980	0.305	0.960

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.79	0.027	-0.231	0.031	0.053
-2.77	-0.043	-0.055	0.026	0.003
-0.75	-0.096	0.111	0.027	0.012
1.28	-0.136	0.269	0.031	0.073
3.30	-0.165	0.419	0.038	0.175
5.31	-0.187	0.558	0.049	0.312
7.33	-0.205	0.684	0.070	0.468
9.35	-0.220	0.794	0.102	0.630
10.35	-0.228	0.840	0.124	0.706
11.36	-0.237	0.881	0.148	0.777
12.36	-0.247	0.916	0.175	0.839
13.37	-0.258	0.944	0.204	0.891
14.37	-0.270	0.965	0.234	0.931
15.37	-0.285	0.978	0.262	0.956
16.37	0.000	0.983	0.286	0.966
17.37	0.000	0.980	0.305	0.961

TRIM CONDITIONS

AOA	CM	CL	CD	DCM/DALPHA	DCL/DALPHA
-4.07	-0.34E-06	-0.167	0.028	-.0354	0.0879

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	-0.112E+00	0.171E+00	0.284E-01	-0.205E-01	0.786E-01
A2	-0.205E-01	0.786E-01	0.194E-02	0.296E-02	-0.191E-02
A3	0.148E-02	-0.953E-03	0.219E-03	-0.172E-03	0.355E-05
A4	-0.574E-04	0.118E-05	-0.100E-04	0.000E+01	-0.196E-04
A5	0.000E+01	-0.489E-05	0.979E-05	0.000E+01	0.538E-06
A6	0.000E+01	0.102E-06	-0.417E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.79	-0.0386	0.0903
-2.77	-0.0300	0.0844
-0.75	-0.0228	0.0801
1.28	-0.0170	0.0762
3.30	-0.0126	0.0717
5.31	-0.0096	0.0661
7.33	-0.0080	0.0587
9.35	-0.0078	0.0493
10.35	-0.0092	0.0437
11.36	-0.0090	0.0377
12.36	-0.0102	0.0312
13.37	-0.0116	0.0243
14.37	-0.0134	0.0169
15.37	-0.0156	0.0092

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.230	0.020	0.030	0.031	0.011	0.025
-0.056	-0.039	0.031	0.026	0.078	0.031
0.107	-0.088	0.021	0.026	0.175	0.039
0.279	-0.133	0.029	0.031	0.308	0.050
0.419	-0.165	0.043	0.039	0.458	0.063
0.555	-0.191	0.055	0.050	0.000	0.000
0.677	-0.211	0.065	0.063	0.000	0.000
0.794	-0.227	0.093	0.000	0.000	0.000
0.847	-0.233	0.121	0.000	0.000	0.000
0.886	-0.237	0.151	0.000	0.000	0.000
0.917	-0.240	0.183	0.000	0.000	0.000
0.939	-0.242	0.211	0.000	0.000	0.000
0.962	0.000	0.247	0.000	0.000	0.000
0.976	0.000	0.271	0.000	0.000	0.000
0.986	0.000	0.289	0.000	0.000	0.000
0.980	0.000	0.277	0.000	0.000	0.000

TRIM CONDITION

CL	CM	CD	CMCL
-0.172	-0.32E-11	0.029	-0.3487

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	-0.566E-01	0.259E-01	0.256E-01	0.245E-01
A2	-0.308E+00	-0.825E-01	-0.428E-02	0.832E-01
A3	0.118E+00	0.209E+00	0.670E-01	0.000E+01
A4	0.000E+01	0.122E+01	0.000E+01	0.000E+01
A5	0.000E+01	-0.339E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.233E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.230	-0.3622	0.6122
-0.056	-0.3214	0.5714
0.107	-0.2831	0.5331
0.279	-0.2424	0.4924
0.419	-0.2097	0.4597
0.555	-0.1776	0.4276
0.677	-0.1489	0.3989
0.794	-0.1213	0.3713
0.847	-0.1088	0.3588
0.886	-0.0997	0.3497
0.917	-0.0925	0.3425
0.939	-0.0873	0.3373

STABILIZER 4.0 DEGREES RUDDER 0.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.27	0.000	-0.227	0.037	0.051
-2.25	-0.047	-0.051	0.034	0.003
-0.23	-0.091	0.104	0.028	0.011
1.80	-0.171	0.286	0.039	0.082
3.82	-0.164	0.413	0.037	0.170
5.83	-0.193	0.556	0.061	0.310
7.85	-0.202	0.675	0.068	0.456
9.87	-0.231	0.799	0.119	0.638
10.87	-0.221	0.840	0.137	0.705
11.88	-0.243	0.887	0.152	0.787
12.88	-0.257	0.924	0.184	0.853
13.89	-0.255	0.940	0.213	0.883
14.89	-0.270	0.965	0.244	0.931
15.89	-0.311	0.986	0.270	0.973
16.89	-0.360	1.006	0.299	1.013
17.89	-0.260	0.969	0.316	0.939

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.27	0.009	-0.227	0.038	0.051
-2.25	-0.055	-0.054	0.032	0.003
-0.23	-0.108	0.114	0.032	0.013
1.80	-0.145	0.272	0.035	0.074
3.82	-0.171	0.420	0.042	0.176
5.83	-0.190	0.557	0.055	0.310
7.85	-0.206	0.681	0.077	0.464
9.87	-0.222	0.791	0.112	0.625
10.87	-0.230	0.839	0.133	0.704
11.88	-0.240	0.883	0.158	0.779
12.88	-0.251	0.920	0.185	0.847
13.89	-0.265	0.951	0.214	0.904
14.89	-0.280	0.973	0.243	0.947
15.89	-0.299	0.986	0.271	0.973
16.89	0.000	0.988	0.297	0.977
17.89	0.000	0.977	0.318	0.955

TRIM CONDITIONS

AOA	CM	CL	CD	DCM/DALPHA	DCL/DALPHA
-4.04	-0.33E-06	-0.206	0.037	-.0366	0.0860

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	-0.113E+00	0.132E+00	0.320E-01	-0.204E-01	0.802E-01
A2	-0.204E-01	0.802E-01	0.955E-03	0.321E-02	-0.220E-02
A3	0.160E-02	-0.110E-02	0.351E-03	-0.200E-03	-0.122E-03
A4	-0.665E-04	-0.407E-04	-0.607E-05	0.000E+01	0.131E-04
A5	0.000E+01	0.328E-05	0.758E-05	0.000E+01	-0.928E-06
A6	0.000E+01	-0.186E-06	-0.319E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.27	-0.0377	0.0861
-2.25	-0.0286	0.0844
-0.23	-0.0211	0.0807
1.80	-0.0152	0.0760
3.82	-0.0110	0.0706
5.83	-0.0085	0.0648
7.85	-0.0075	0.0582
9.87	-0.0082	0.0504
10.87	-0.0091	0.0457
11.88	-0.0104	0.0404
12.88	-0.0122	0.0341
13.89	-0.0143	0.0267
14.89	-0.0169	0.0181
15.89	-0.0198	0.0079

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.227	0.001	0.037	0.038	0.011	0.029
-0.051	-0.054	0.034	0.031	0.082	0.035
0.104	-0.097	0.029	0.030	0.170	0.043
0.286	-0.141	0.035	0.036	0.310	0.056
0.413	-0.169	0.044	0.043	0.456	0.070
0.556	-0.195	0.056	0.056	0.000	0.000
0.675	-0.215	0.072	0.070	0.000	0.000
0.799	-0.232	0.111	0.000	0.000	0.000
0.840	-0.237	0.133	0.000	0.000	0.000
0.887	-0.242	0.167	0.000	0.000	0.000
0.924	-0.246	0.202	0.000	0.000	0.000
0.940	-0.248	0.219	0.000	0.000	0.000
0.965	0.000	0.250	0.000	0.000	0.000
0.986	0.000	0.282	0.000	0.000	0.000
1.006	0.000	0.314	0.000	0.000	0.000
0.969	0.000	0.256	0.000	0.000	0.000

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	-0.686E-01	0.314E-01	0.304E-01	0.276E-01
A2	-0.283E+00	-0.420E-01	-0.111E-01	0.934E-01
A3	0.982E-01	0.143E+00	0.103E+00	0.000E+01
A4	0.000E+01	0.522E+00	0.000E+01	0.000E+01
A5	0.000E+01	-0.159E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.124E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.227	-0.3273	0.5773
-0.051	-0.2927	0.5427
0.104	-0.2622	0.5122
0.286	-0.2266	0.4766
0.413	-0.2017	0.4517
0.556	-0.1734	0.4234
0.675	-0.1500	0.4000
0.799	-0.1258	0.3758
0.840	-0.1178	0.3678
0.887	-0.1085	0.3585
0.924	-0.1013	0.3513
0.940	-0.0981	0.3481

STABILIZER 2.0 DEGREES RUDDER 0.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.79	0.080	-0.245	0.025	0.060
-2.77	0.036	-0.080	0.021	0.006
-0.75	-0.028	0.085	0.021	0.007
1.27	-0.080	0.257	0.028	0.066
3.29	-0.117	0.399	0.032	0.159
5.31	-0.144	0.540	0.048	0.291
7.33	-0.161	0.663	0.061	0.439
9.35	-0.173	0.784	0.102	0.615
10.35	-0.186	0.834	0.120	0.695
11.36	-0.191	0.873	0.142	0.762
12.36	-0.192	0.904	0.170	0.817
13.36	-0.203	0.930	0.206	0.864
14.37	-0.218	0.946	0.232	0.895
15.37	-0.242	0.961	0.258	0.924
16.37	-0.273	0.974	0.290	0.949
17.37	-0.261	0.959	0.301	0.919

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.79	0.091	-0.247	0.025	0.061
-2.77	0.021	-0.077	0.020	0.006
-0.75	-0.035	0.088	0.022	0.008
1.27	-0.078	0.248	0.027	0.061
3.29	-0.111	0.400	0.034	0.160
5.31	-0.137	0.542	0.045	0.294
7.33	-0.158	0.670	0.065	0.459
9.35	-0.175	0.781	0.098	0.610
10.35	-0.184	0.828	0.120	0.686
11.36	-0.192	0.870	0.145	0.756
12.36	-0.201	0.904	0.173	0.817
13.36	-0.210	0.932	0.202	0.868
14.37	-0.220	0.952	0.232	0.906
15.37	-0.232	0.964	0.261	0.928
16.37	0.000	0.967	0.286	0.935
17.37	0.000	0.961	0.303	0.924

TRIM CONDITIONS

AOA	CM	CL	CD	DCM/DALPHA	DCL/DALPHA
-2.07	-0.94E-07	-0.019	0.020	-.0280	0.0820

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	-0.520E-01	0.148E+00	0.238E-01	-0.221E-01	0.795E-01
A2	-0.221E-01	0.795E-01	0.237E-02	0.277E-02	-0.143E-02
A3	0.138E-02	-0.713E-03	0.142E-03	-0.138E-03	-0.121E-03
A4	-0.459E-04	-0.403E-04	-0.196E-04	0.000E+01	-0.918E-05
A5	0.000E+01	-0.230E-05	0.119E-04	0.000E+01	0.214E-06
A6	0.000E+01	0.428E-07	-0.498E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.79	-0.0385	0.0847
-2.77	-0.0308	0.0827
-0.75	-0.0243	0.0805
1.27	-0.0188	0.0775
3.29	-0.0145	0.0732
5.31	-0.0113	0.0673
7.33	-0.0092	0.0596
9.35	-0.0083	0.0498
10.35	-0.0082	0.0441
11.36	-0.0084	0.0378
12.36	-0.0089	0.0311
13.36	-0.0097	0.0238
14.37	-0.0108	0.0160
15.37	-0.0121	0.0076

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.245	0.086	0.024	0.025	0.007	0.021
-0.080	0.025	0.026	0.021	0.066	0.026
0.085	-0.029	0.016	0.021	0.159	0.035
0.257	-0.077	0.024	0.026	0.291	0.047
0.399	-0.112	0.039	0.035	0.439	0.061
0.540	-0.141	0.050	0.047	0.000	0.000
0.663	-0.163	0.059	0.061	0.000	0.000
0.784	-0.180	0.089	0.000	0.000	0.000
0.834	-0.187	0.116	0.000	0.000	0.000
0.873	-0.191	0.148	0.000	0.000	0.000
0.904	-0.194	0.182	0.000	0.000	0.000
0.930	-0.197	0.216	0.000	0.000	0.000
0.946	0.000	0.242	0.000	0.000	0.000
0.961	0.000	0.268	0.000	0.000	0.000
0.974	0.000	0.293	0.000	0.000	0.000
0.959	0.000	0.264	0.000	0.000	0.000

TRIM CONDITION

CL	CM	CD	CMCL
-0.006	-0.21E-11	0.020	-0.3276

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	-0.189E-02	0.190E-01	0.200E-01	0.199E-01
A2	-0.326E+00	-0.692E-01	0.405E-03	0.932E-01
A3	0.126E+00	0.270E+00	0.924E-01	0.000E+01
A4	0.000E+01	0.988E+00	0.000E+01	0.000E+01
A5	0.000E+01	-0.323E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.237E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.245	-0.3878	0.6378
-0.080	-0.3463	0.5963
0.085	-0.3048	0.5548
0.257	-0.2617	0.5117
0.399	-0.2260	0.4760
0.540	-0.1907	0.4407
0.663	-0.1598	0.4098
0.784	-0.1292	0.3792
0.834	-0.1168	0.3668
0.873	-0.1069	0.3569
0.904	-0.0992	0.3492
0.930	-0.0927	0.3427

STABILIZER 0.0 DEGREES RUDDER 0.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.79	0.119	-0.260	0.033	0.067
-2.77	0.082	-0.090	0.028	0.008
-0.75	0.026	0.068	0.025	0.005
1.27	-0.021	0.240	0.035	0.057
3.29	-0.061	0.384	0.037	0.148
5.31	-0.090	0.523	0.048	0.274
7.33	-0.118	0.651	0.065	0.424
9.34	-0.135	0.769	0.101	0.591
10.35	-0.148	0.817	0.126	0.668
11.36	-0.155	0.859	0.144	0.738
12.36	-0.149	0.887	0.173	0.787
13.36	-0.171	0.917	0.205	0.841
14.37	-0.205	0.934	0.229	0.872
15.37	-0.213	0.950	0.255	0.903
16.37	-0.216	0.944	0.281	0.891
17.37	-0.220	0.936	0.307	0.877

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.79	0.129	-0.260	0.033	0.067
-2.77	0.069	-0.091	0.028	0.008
-0.75	0.020	0.074	0.028	0.005
1.27	-0.021	0.233	0.031	0.054
3.29	-0.056	0.384	0.037	0.148
5.31	-0.085	0.526	0.048	0.277
7.33	-0.110	0.655	0.069	0.429
9.34	-0.134	0.767	0.101	0.588
10.35	-0.145	0.814	0.122	0.663
11.36	-0.157	0.856	0.146	0.732
12.36	-0.168	0.891	0.173	0.793
13.36	-0.181	0.918	0.201	0.842
14.37	-0.193	0.936	0.230	0.877
15.37	-0.207	0.946	0.258	0.895
16.37	0.000	0.946	0.284	0.855
17.37	0.000	0.935	0.305	0.875

TRIM CONDITIONS

AOA	CM	CL	CD	DCM/DALPHA	DCL/DALPHA
0.18	-0.22E-07	0.148	0.029	-.0205	0.0767

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPLHA/AOA
A1	0.379E-02	0.133E+00	0.288E-01	-0.208E-01	0.790E-01
A2	-0.209E-01	0.790E-01	0.121E-02	0.190E-02	-0.143E-02
A3	0.950E-03	-0.713E-03	0.267E-03	-0.952E-04	-0.907E-04
A4	-0.317E-04	-0.302E-04	0.804E-05	0.000E+01	-0.102E-04
A5	0.000E+01	-0.254E-05	0.722E-05	0.000E+01	0.112E-06
A6	0.000E+01	0.223E-07	-0.332E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.79	-0.0321	0.0849
-2.77	-0.0268	0.0825
-0.75	-0.0223	0.0800
1.27	-0.0186	0.0770
3.29	-0.0156	0.0730
5.31	-0.0134	0.0674
7.33	-0.0120	0.0600
9.34	-0.0114	0.0503
10.35	-0.0114	0.0445
11.36	-0.0115	0.0381
12.36	-0.0119	0.0309
13.36	-0.0124	0.0230
14.37	-0.0132	0.0144
15.37	-0.0141	0.0050

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.260	0.125	0.033	0.033	0.005	0.026
-0.090	0.072	0.031	0.027	0.057	0.031
0.068	0.026	0.023	0.027	0.148	0.039
0.240	-0.021	0.031	0.031	0.274	0.050
0.384	-0.057	0.043	0.039	0.424	0.064
0.523	-0.088	0.052	0.050	0.000	0.000
0.651	-0.115	0.062	0.064	0.000	0.000
0.769	-0.138	0.092	0.000	0.000	0.000
0.817	-0.147	0.119	0.000	0.000	0.000
0.859	-0.154	0.154	0.000	0.000	0.000
0.887	-0.159	0.184	0.000	0.000	0.000
0.917	-0.164	0.223	0.000	0.000	0.000
0.934	0.000	0.250	0.000	0.000	0.000
0.950	0.000	0.278	0.000	0.000	0.000
0.944	0.000	0.267	0.000	0.000	0.000
0.936	0.000	0.254	0.000	0.000	0.000

TRIM CONDITION

CL	CM	CD	CMCL
0.161	0.15E-12	0.028	-0.2691

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	0.451E-01	0.245E-01	0.265E-01	0.260E-01
A2	-0.291E+00	-0.477E-01	-0.272E-02	0.884E-01
A3	0.698E-01	0.256E+00	0.917E-01	0.000E+01
A4	0.000E+01	0.560E+00	0.000E+01	0.000E+01
A5	0.000E+01	-0.249E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.206E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.260	-0.3269	0.5769
-0.090	-0.3036	0.5536
0.068	-0.2818	0.5318
0.240	-0.2582	0.5082
0.384	-0.2383	0.4883
0.523	-0.2192	0.4692
0.651	-0.2016	0.4516
0.769	-0.1854	0.4354
0.817	-0.1788	0.4288
0.859	-0.1730	0.4230
0.887	-0.1691	0.4191
0.917	-0.1650	0.4150

STABILIZER 0.0 DEGREES RUDDER 0.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.28	0.109	-0.269	0.035	0.073
-2.25	0.086	-0.105	0.032	0.011
-0.23	0.029	0.054	0.027	0.003
1.79	-0.023	0.228	0.028	0.052
3.81	-0.055	0.369	0.035	0.136
5.63	-0.084	0.512	0.047	0.262
7.85	-0.120	0.642	0.066	0.412
9.86	-0.129	0.756	0.103	0.571
10.87	-0.135	0.807	0.124	0.651
11.87	-0.154	0.848	0.141	0.719
12.88	-0.149	0.879	0.170	0.773
13.88	-0.158	0.905	0.201	0.819
14.88	-0.173	0.926	0.228	0.857
15.89	-0.195	0.945	0.258	0.892
16.89	-0.236	0.960	0.290	0.921
17.89	-0.184	0.940	0.303	0.884

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.28	0.121	-0.270	0.036	0.073
-2.25	0.069	-0.106	0.029	0.011
-0.23	0.023	0.059	0.028	0.003
1.79	-0.017	0.219	0.029	0.048
3.81	-0.052	0.373	0.035	0.139
5.83	-0.082	0.515	0.046	0.265
7.85	-0.108	0.643	0.067	0.414
9.86	-0.130	0.754	0.100	0.569
10.87	-0.140	0.802	0.121	0.644
11.87	-0.150	0.845	0.145	0.713
12.88	-0.159	0.880	0.171	0.775
13.88	-0.167	0.910	0.200	0.827
14.88	-0.175	0.931	0.229	0.867
15.89	-0.183	0.945	0.258	0.893
16.89	0.000	0.950	0.284	0.902
17.89	0.000	0.945	0.306	0.893

TRIM CONDITIONS

AOA	CM	CL	CD	DCM/DALPHA	DCL/DALPHA
0.89	-0.52E-07	0.149	0.028	-.0196	0.0794

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	0.180E-01	0.774E-01	0.278E-01	-0.209E-01	0.805E-01
A2	-0.209E-01	0.805E-01	0.297E-03	0.143E-02	-0.102E-02
A3	0.716E-03	-0.511E-03	0.324E-03	-0.375E-04	-0.230E-03
A4	-0.125E-04	-0.765E-04	-0.526E-05	0.000E+01	0.476E-05
A5	0.000E+01	0.119E-05	0.763E-05	0.000E+01	-0.252E-06
A6	0.000E+01	-0.504E-07	-0.318E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.28	-0.0277	0.0802
-2.25	-0.0243	0.0816
-0.23	-0.0212	0.0807
1.79	-0.0184	0.0779
3.81	-0.0160	0.0735
5.83	-0.0138	0.0674
7.85	-0.0120	0.0597
9.86	-0.0104	0.0502
10.87	-0.0097	0.0448
11.87	-0.0092	0.0389
12.88	-0.0087	0.0325
13.88	-0.0082	0.0254
14.88	-0.0079	0.0177
15.89	-0.0076	0.0093

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.269	0.120	0.034	0.037	0.003	0.024
-0.105	0.071	0.035	0.028	0.052	0.029
0.054	0.026	0.022	0.025	0.136	0.037
0.226	-0.019	0.026	0.029	0.262	0.045
0.369	-0.052	0.039	0.036	0.412	0.064
0.512	-0.084	0.051	0.049	0.000	0.000
0.642	-0.111	0.064	0.064	0.000	0.000
0.756	-0.132	0.093	0.000	0.000	0.000
0.807	-0.141	0.118	0.000	0.000	0.000
0.848	-0.148	0.148	0.000	0.000	0.000
0.879	-0.153	0.179	0.000	0.000	0.000
0.905	-0.158	0.209	0.000	0.000	0.000
0.926	0.000	0.239	0.000	0.000	0.000
0.945	0.000	0.269	0.000	0.000	0.000
0.960	0.000	0.296	0.000	0.000	0.000
0.940	0.000	0.261	0.000	0.000	0.000

TRIM CONDITION

CL	CM	CD	CMCL
0.154	-0.10E-11	0.027	-0.2570

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	0.409E-01	0.255E-01	0.258E-01	0.235E-01
A2	-0.276E+00	-0.754E-01	-0.125E-01	0.980E-01
A3	0.627E-01	0.284E+00	0.112E+00	0.000E+01
A4	0.000E+01	0.777E+00	0.000E+01	0.000E+01
A5	0.000E+01	-0.274E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.211E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.269	-0.3100	0.5600
-0.105	-0.2895	0.5395
0.054	-0.2694	0.5194
0.228	-0.2476	0.4976
0.369	-0.2300	0.4800
0.512	-0.2120	0.4620
0.642	-0.1957	0.4457
0.756	-0.1814	0.4314
0.807	-0.1750	0.4250
0.848	-0.1699	0.4199
0.879	-0.1659	0.4159
0.905	-0.1627	0.4127

STABILIZER -2.0 DEGREES RUDDER 0.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.80	0.169	-0.286	0.029	0.082
-2.77	0.129	-0.112	0.026	0.012
-0.75	0.073	0.048	0.024	0.002
1.27	0.042	0.213	0.027	0.045
3.29	0.009	0.355	0.030	0.126
5.31	-0.025	0.497	0.045	0.247
7.32	-0.041	0.622	0.061	0.386
9.34	-0.084	0.746	0.104	0.557
10.35	-0.097	0.797	0.115	0.635
11.35	-0.100	0.837	0.141	0.700
12.36	-0.112	0.873	0.173	0.762
13.36	-0.130	0.896	0.203	0.802
14.36	-0.152	0.928	0.234	0.861
15.37	-0.173	0.934	0.256	0.872
16.37	-0.187	0.939	0.275	0.882
17.36	-0.160	0.923	0.293	0.851

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.80	0.172	-0.286	0.030	0.082
-2.77	0.121	-0.112	0.025	0.013
-0.75	0.078	0.052	0.025	0.003
1.27	0.041	0.208	0.027	0.043
3.29	0.008	0.357	0.032	0.127
5.31	-0.021	0.497	0.042	0.247
7.32	-0.049	0.627	0.063	0.393
9.34	-0.076	0.742	0.098	0.551
10.35	-0.090	0.792	0.120	0.628
11.35	-0.104	0.836	0.145	0.699
12.36	-0.119	0.874	0.173	0.763
13.36	-0.135	0.903	0.201	0.816
14.36	-0.151	0.924	0.230	0.854
15.37	-0.169	0.935	0.256	0.876
16.37	0.000	0.936	0.278	0.875
17.36	0.000	0.924	0.292	0.854

TRIM CONDITIONS

AOA	CM	CL	CD	DCM/DALPHA	DCL/DALPHA
3.84	-0.53E-07	0.396	0.034	-.0148	0.0708

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	0.634E-01	0.111E+00	0.254E-01	-0.187E-01	0.776E-01
A2	-0.127E-01	0.776E-01	0.880E-03	0.137E-02	-0.172E-02
A3	0.683E-03	-0.860E-03	0.183E-03	-0.877E-04	0.569E-04
A4	-0.292E-04	0.190E-04	0.124E-04	0.000E+01	-0.191E-04
A5	0.000E+01	-0.477E-05	0.910E-05	0.000E+01	0.189E-06
A6	0.000E+01	0.378E-07	-0.641E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.80	-0.0273	0.0894
-2.77	-0.0232	0.0832
-0.75	-0.0198	0.0789
1.27	-0.0171	0.0755
3.29	-0.0152	0.0719
5.31	-0.0140	0.0674
7.32	-0.0134	0.0611
9.34	-0.0136	0.0524
10.35	-0.0140	0.0469
11.35	-0.0145	0.0406
12.36	-0.0152	0.0334
13.36	-0.0161	0.0253
14.36	-0.0172	0.0161
15.37	-0.0184	0.0059

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.286	0.167	0.029	0.031	0.002	0.022
-0.112	0.124	0.029	0.024	0.045	0.026
0.048	0.084	0.020	0.022	0.126	0.034
0.213	0.044	0.024	0.026	0.247	0.046
0.355	0.010	0.035	0.034	0.386	0.060
0.497	-0.024	0.047	0.046	0.000	0.000
0.622	-0.054	0.060	0.059	0.000	0.000
0.746	-0.084	0.092	0.000	0.000	0.000
0.797	-0.096	0.118	0.000	0.000	0.000
0.837	-0.105	0.147	0.000	0.000	0.000
0.873	-0.114	0.182	0.000	0.000	0.000
0.896	-0.119	0.210	0.000	0.000	0.000
0.928	0.000	0.256	0.000	0.000	0.000
0.934	0.000	0.265	0.000	0.000	0.000
0.939	0.000	0.274	0.000	0.000	0.000
0.923	0.000	0.248	0.000	0.000	0.000

TRIM CONDITION

CL	CM	CD	CMCL
0.396	-0.72E-11	0.037	-0.2410

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	0.962E-01	0.217E-01	0.222E-01	0.215E-01
A2	-0.245E+00	-0.485E-01	-0.298E-02	0.986E-01
A3	0.489E-02	0.263E+00	0.101E+00	0.000E+01
A4	0.000E+01	0.468E+00	0.000E+01	0.000E+01
A5	0.000E+01	-0.208E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.178E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.286	-0.2476	0.4976
-0.112	-0.2459	0.4959
0.048	-0.2444	0.4944
0.213	-0.2427	0.4927
0.355	-0.2414	0.4914
0.497	-0.2400	0.4900
0.622	-0.2368	0.4888
0.746	-0.2375	0.4875
0.797	-0.2370	0.4870
0.837	-0.2367	0.4867
0.873	-0.2363	0.4863
0.896	-0.2361	0.4861

STABILIZER -2.0 DEGREES RUDDER 0.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.28	0.171	-0.281	0.044	0.079
-2.26	0.142	-0.113	0.038	0.013
-0.23	0.073	0.048	0.026	0.002
1.79	0.018	0.230	0.033	0.053
3.81	0.001	0.365	0.033	0.133
5.83	-0.015	0.497	0.040	0.247
7.85	-0.062	0.635	0.057	0.403
9.86	-0.070	0.757	0.112	0.573
10.87	-0.107	0.803	0.125	0.644
11.87	-0.105	0.837	0.142	0.701
12.88	-0.121	0.867	0.173	0.751
13.88	-0.106	0.893	0.208	0.798
14.88	-0.132	0.921	0.226	0.848
15.88	-0.127	0.930	0.262	0.864
16.89	-0.147	0.937	0.283	0.878
17.88	-0.138	0.920	0.294	0.847

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.28	0.177	-0.282	0.044	[illegible]
-2.26	0.125	-0.111	0.036	0.012
-0.23	0.078	0.055	0.031	0.003
1.79	0.037	0.215	0.029	0.046
3.81	0.000	0.367	0.032	0.134
5.83	-0.032	0.508	0.042	0.258
7.85	-0.059	0.637	0.065	0.406
9.86	-0.083	0.748	0.100	0.560
10.87	-0.093	0.796	0.123	0.633
11.87	-0.103	0.837	0.148	0.701
12.88	-0.111	0.872	0.176	0.761
13.88	-0.119	0.900	0.204	0.810
14.88	-0.125	0.919	0.232	0.845
15.88	-0.131	0.930	0.259	0.865
16.89	0.000	0.931	0.251	0.868
17.88	0.000	0.923	0.296	0.851

TRIM CONDITIONS

AOA	CM	CL	CD	DCM/DALPHA	DCL/DALPHA
3.82	-0.15E-06	0.367	0.032	-.0169	0.0730

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	0.732E-01	0.733E-01	0.306E-01	-0.215E-01	0.603E-01
A2	-0.215E-01	0.803E-01	-0.174E-02	0.124E-02	-0.147E-02
A3	0.618E-03	-0.737E-03	0.337E-03	-0.146E-04	-0.[illegible]77E-04
A4	-0.486E-05	-0.292E-04	0.302E-04	0.000E+01	-0.792E-05
A5	0.000E+01	-0.198E-05	0.571E-05	0.000E+01	0.490E-07
A6	0.000E+01	0.981E-08	-0.311E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.28	-0.0270	0.0857
-2.26	-0.0243	0.0833
-0.23	-0.0217	0.0807
1.79	-0.0193	0.0774
3.81	-0.0170	0.0730
5.83	-0.0147	0.0673
7.85	-0.0127	0.0597
9.86	-0.0107	0.0501
10.87	-0.0098	0.0445
11.87	-0.0098	0.0382
12.88	-0.0080	0.0313
13.88	-0.0071	0.0236
14.88	-0.0063	0.0153
15.88	-0.0055	0.0062

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.281	0.175	0.044	0.045	0.002	0.026
-0.113	0.126	0.039	0.034	0.053	0.030
0.048	0.082	0.027	0.029	0.133	0.035
0.230	0.034	0.028	0.030	0.247	0.044
0.365	0.001	0.036	0.035	0.403	0.055
0.497	-0.030	0.048	0.043	0.000	0.000
0.635	-0.061	0.059	0.055	0.000	0.000
0.757	-0.086	0.096	0.000	0.000	0.000
0.803	-0.096	0.124	0.000	0.000	0.000
0.837	-0.103	0.152	0.000	0.000	0.000
0.867	-0.109	0.181	0.000	0.000	0.000
0.893	-0.114	0.214	0.000	0.000	0.000
0.921	0.000	0.254	0.000	0.000	0.000
0.930	0.000	0.269	0.000	0.000	0.000
0.937	0.000	0.280	0.000	0.000	0.000
0.920	0.000	0.253	0.000	0.000	0.000

TRIM CONDITION

CL	CM	CD	CMCL
0.369	0.34E-12	0.035	-0.2402

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	0.946E-01	0.293E-01	0.302E-01	0.259E-01
A2	-0.273E+00	-0.642E-01	-0.255E-01	0.718E-01
A3	0.446E-01	0.249E+00	0.102E+00	0.000E+01
A4	0.000E+01	0.396E+00	0.000E+01	0.000E+01
A5	0.000E+01	-0.198E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.168E+01	0.000E+01	0.000E+01

CL	CMCL	HM
-0.281	-0.2981	0.5481
-0.113	-0.2831	0.5331
0.048	-0.2688	0.5188
0.230	-0.2526	0.5026
0.365	-0.2406	0.4906
0.497	-0.2288	0.4788
0.635	-0.2165	0.4665
0.757	-0.2056	0.4556
0.803	-0.2015	0.4515
0.837	-0.1984	0.4484
0.867	-0.1958	0.4458
0.893	-0.1934	0.4434

STABILIZER -6.0 DEGREES RUDDER 0.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.80	0.288	-0.332	0.044	0.110
-2.78	0.233	-0.150	0.035	0.023
-0.76	0.178	0.092	0.034	0.008
1.26	0.141	0.164	0.034	0.027
3.28	0.106	0.307	0.035	0.094
5.30	0.084	0.448	0.052	0.200
7.32	0.052	0.578	0.060	0.334
9.33	0.023	0.700	0.094	0.491
10.34	0.019	0.754	0.109	0.569
11.35	0.001	0.796	0.128	0.634
12.35	-0.014	0.835	0.160	0.698
13.35	-0.026	0.856	0.189	0.732
14.36	-0.037	0.877	0.212	0.770
15.36	-0.071	0.899	0.239	0.808
16.36	-0.134	0.917	0.257	0.841
17.36	-0.071	0.890	0.274	0.792

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.80	0.290	-0.332	0.045	0.110
-2.78	0.230	-0.154	0.035	0.024
-0.76	0.180	0.007	0.034	0.000
1.26	0.140	0.160	0.035	0.026
3.28	0.107	0.307	0.038	0.094
5.30	0.079	0.449	0.046	0.201
7.32	0.054	0.581	0.063	0.338
9.33	0.029	0.698	0.091	0.488
10.34	0.016	0.750	0.111	0.562
11.35	0.002	0.795	0.133	0.631
12.35	-0.012	0.833	0.159	0.693
13.35	-0.028	0.863	0.185	0.745
14.36	-0.045	0.855	0.212	0.731
15.36	-0.064	0.898	0.238	0.807
16.36	0.000	0.903	0.259	0.815
17.36	0.000	0.897	0.273	0.805

TRIM CONDITIONS

AOA	CM	CL	CD	DCM/DALPHA	DCL/DALPHA
11.50	-0.13E-06	0.801	0.137	-.0141	0.[illegible]104

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	0.164E+00	0.656E-01	0.339E-01	-0.202E-01	0.758E-01
A2	-0.202E-01	0.758E-01	0.650E-03	0.204E-02	-0.156E-02
A3	0.102E-02	-0.778E-03	0.176E-03	-0.131E-03	0.226E-03
A4	-0.437E-04	0.755E-04	-0.226E-04	0.000E+01	-0.448E-04
A5	0.000E+01	-0.112E-04	0.118E-04	0.000E+01	0.118E-05
A6	0.000E+01	0.236E-06	-0.491E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.80	-0.0331	0.0941
-2.78	-0.0269	0.0829
-0.76	-0.0219	0.0771
1.26	-0.0179	0.0741
3.28	-0.0150	0.0717
5.30	-0.0131	0.0682
7.32	-0.0123	0.0624
9.33	-0.0126	0.0535
10.34	-0.0132	0.0479
11.35	-0.0140	0.0414
12.35	-0.0151	0.0342
13.35	-0.0164	0.0263
14.36	-0.0180	0.0177
15.36	-0.0199	0.0087

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.332	0.284	0.044	0.045	0.000	0.032
-0.150	0.231	0.038	0.035	0.027	0.034
0.002	0.189	0.030	0.032	0.094	0.040
0.164	0.146	0.033	0.034	0.200	0.049
0.307	0.110	0.041	0.039	0.334	0.061
0.448	0.076	0.049	0.049	0.000	0.000
0.578	0.046	0.060	0.061	0.000	0.000
0.700	0.019	0.087	0.000	0.000	0.000
0.754	0.008	0.110	0.000	0.000	0.000
0.796	-0.001	0.137	0.000	0.000	0.000
0.835	-0.009	0.170	0.000	0.000	0.000
0.856	-0.013	0.191	0.000	0.000	0.000
0.877	0.000	0.216	0.000	0.000	0.000
0.899	0.000	0.246	0.000	0.000	0.000
0.917	0.000	0.273	0.000	0.000	0.000
0.890	0.000	0.233	0.000	0.000	0.000

TRIM CONDITION

CL	CM	CD	CMCL
0.792	-0.23E-11	0.134	-0.2075

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	0.189E+00	0.303E-01	0.321E-01	0.316E-01
A2	-0.270E+00	-0.211E-01	-0.658E-02	0.875E-01
A3	0.396E-01	0.247E+00	0.979E-01	0.000E+01
A4	0.000E+01	0.218E-01	0.000E+01	0.000E+01
A5	0.000E+01	-0.118E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.134E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.332	-0.2967	0.5467
-0.150	-0.2822	0.5322
0.002	-0.2702	0.5202
0.164	-0.2573	0.5073
0.307	-0.2460	0.4960
0.448	-0.2348	0.4848
0.578	-0.2245	0.4745
0.700	-0.2148	0.4648
0.754	-0.2106	0.4606
0.796	-0.2072	0.4572
0.835	-0.2041	0.4541
0.856	-0.2025	0.4525

STABILIZER -6.0 DEGREES RUDDER 0.0 DEGREES

APIA CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.28	0.267	-0.321	0.048	0.103
-2.26	0.218	-0.144	0.039	0.021
-0.24	0.169	0.013	0.029	0.000
1.78	0.107	0.186	0.033	0.035
3.80	0.095	0.325	0.031	0.106
5.82	0.070	0.462	0.054	0.213
7.84	0.059	0.586	0.063	0.343
9.86	0.032	0.711	0.101	0.506
10.86	-0.011	0.765	0.117	0.585
11.87	0.006	0.797	0.141	0.636
12.87	-0.017	0.835	0.172	0.698
13.87	-0.012	0.857	0.198	0.734
14.88	-0.055	0.884	0.231	0.782
15.88	-0.037	0.897	0.243	0.804
16.88	-0.096	0.910	0.279	0.828
17.88	-0.071	0.895	0.283	0.801

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.28	0.269	-0.321	0.049	0.103
-2.26	0.212	-0.145	0.036	0.021
-0.24	0.164	0.020	0.032	0.000
1.78	0.126	0.176	0.032	0.031
3.80	0.094	0.325	0.036	0.106
5.82	0.067	0.465	0.046	0.216
7.84	0.044	0.594	0.066	0.353
9.86	0.022	0.707	0.099	0.500
10.86	0.011	0.756	0.120	0.571
11.87	0.001	0.798	0.144	0.636
12.87	-0.011	0.835	0.171	0.697
13.87	-0.023	0.864	0.198	0.746
14.88	-0.036	0.885	0.226	0.784
15.88	-0.050	0.898	0.251	0.807
16.88	0.000	0.903	0.272	0.815
17.88	0.000	0.898	0.285	0.806

TRIM CONDITIONS

AOA	CM	CL	CD	DCM/DALPHA	DCL/DALPHA
11.92	-0.87E-07	0.800	0.145	-.0111	0.0392

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	0.159E+00	0.387E-01	0.317E-01	-0.206E-01	0.787E-01
A2	-0.206E-01	0.787E-01	-0.500E-03	0.205E-02	-0.191E-02
A3	0.102E-02	-0.954E-03	0.421E-03	-0.105E-03	0.124E-03
A4	-0.349E-04	0.415E-04	-0.350E-04	0.000E+01	-0.281E-04
A5	0.000E+01	-0.703E-05	0.113E-04	0.000E+01	0.654E-06
A6	0.000E+01	0.131E-06	-0.453E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.28	-0.0313	0.0915
-2.26	-0.0258	0.0839
-0.24	-0.0211	0.0791
1.78	-0.0173	0.0755
3.80	-0.0144	0.0718
5.82	-0.0122	0.0670
7.84	-0.0110	0.0603
9.86	-0.0106	0.0512
10.86	-0.0107	0.0457
11.87	-0.0111	0.0395
12.87	-0.0116	0.0327
13.87	-0.0123	0.0253
14.88	-0.0133	0.0173
15.88	-0.0145	0.0087

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.321	0.264	0.047	0.050	0.000	0.027
-0.144	0.213	0.042	0.035	0.035	0.031
0.013	0.171	0.027	0.030	0.106	0.038
0.186	0.128	0.028	0.031	0.213	0.056
0.325	0.095	0.040	0.038	0.343	0.063
0.462	0.065	0.051	0.049	0.000	0.000
0.586	0.040	0.063	0.064	0.000	0.000
0.711	0.016	0.093	0.000	0.000	0.000
0.765	0.006	0.120	0.000	0.000	0.000
0.797	0.000	0.143	0.000	0.000	0.000
0.835	-0.006	0.177	0.000	0.000	0.000
0.857	-0.010	0.202	0.000	0.000	0.000
0.884	0.000	0.238	0.000	0.000	0.000
0.897	0.000	0.257	0.000	0.000	0.000
0.910	0.000	0.280	0.000	0.000	0.000
0.895	0.000	0.255	0.000	0.000	0.000

TRIM CONDITION

CL	CM	CD	CMCL
0.800	-0.45E-12	0.144	-0.1749

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	0.175E+00	0.273E-01	0.301E-01	0.273E-01
A2	-0.262E+00	-0.600E-01	-0.189E-01	0.105E+00
A3	0.544E-01	0.368E+00	0.130E+00	0.000E+01
A4	0.000E+01	0.264E+00	0.000E+01	0.000E+01
A5	0.000E+01	-0.206E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.195E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.321	-0.2968	0.5468
-0.144	-0.2775	0.5275
0.013	-0.2605	0.5105
0.186	-0.2416	0.4916
0.325	-0.2265	0.4765
0.462	-0.2116	0.4616
0.586	-0.1982	0.4482
0.711	-0.1845	0.4345
0.765	-0.1786	0.4286
0.797	-0.1751	0.4251
0.835	-0.1710	0.4210
0.857	-0.1687	0.4187

STABILIZER -10.0 DEGREES   RUDDER 0.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.81	0.338	-0.352	0.055	0.124
-2.79	0.323	-0.194	0.043	0.038
-0.76	0.274	-0.035	0.035	0.001
1.26	0.252	0.130	0.035	0.017
3.28	0.196	0.278	0.034	0.077
5.30	0.169	0.416	0.042	0.173
7.31	0.139	0.548	0.056	0.300
9.33	0.104	0.673	0.096	0.452
10.34	0.080	0.727	0.116	0.528
11.34	0.074	0.764	0.131	0.583
12.35	0.034	0.809	0.157	0.654
13.35	0.048	0.825	0.189	0.681
14.35	0.017	0.852	0.216	0.725
15.36	-0.002	0.871	0.237	0.755
16.36	-0.073	0.893	0.261	0.798
17.36	-0.037	0.873	0.287	0.762

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.81	0.344	-0.353	0.054	0.125
-2.79	0.312	-0.193	0.044	0.037
-0.76	0.278	-0.033	0.036	0.001
1.26	0.244	0.125	0.032	0.016
3.28	0.208	0.277	0.033	0.077
5.30	0.172	0.421	0.042	0.177
7.31	0.136	0.553	0.061	0.306
9.33	0.100	0.669	0.092	0.448
10.34	0.083	0.720	0.112	0.518
11.34	0.066	0.764	0.135	0.584
12.35	0.049	0.803	0.160	0.644
13.35	0.033	0.834	0.186	0.695
14.35	0.017	0.858	0.213	0.736
15.36	0.002	0.873	0.240	0.763
16.36	0.000	0.880	0.264	0.775
17.36	0.000	0.878	0.285	0.771

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	0.265E+00	0.270E-01	0.344E-01	-0.172E-01	0.782E-01
A2	-0.172E-01	0.782E-01	-0.234E-02	-0.288E-03	-0.769E-03
A3	-0.144E-03	-0.384E-03	0.466E-03	0.286E-04	-0.152E-03
A4	0.954E-05	-0.507E-04	0.374E-04	0.000E+01	-0.258E-05
A5	0.000E+01	-0.189E-05	0.314E-05	0.000E+01	0.1[illegible]E-06
A6	0.000E+01	0.299E-07	-0.209E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.81	-0.0151	0.0793
-2.79	-0.0162	0.0793
-0.76	-0.0169	0.0787
1.26	-0.0175	0.0769
3.28	-0.0178	0.0738
5.30	-0.0179	0.0688
7.31	-0.0178	0.0619
9.33	-0.0174	0.0527
10.34	-0.0171	0.0473
11.34	-0.0168	0.0413
12.35	-0.0164	0.0347
13.35	-0.0159	0.0275
14.35	-0.0154	0.0197
15.36	-0.0149	0.0114

LEAST SQUARE DATA FIT ORDER 7

DATA FIT

AOA	CM
9.33	0.102
10.34	0.086
11.34	0.062
12.35	0.045
13.35	0.039
14.35	0.027
15.36	-0.012
16.36	-0.068
17.36	-0.038

POLYNOMIAL COEFFICIENTS

COEF	CM/AOA
A1	0.380E+02
A2	-0.183E+02
A3	0.339E+01
A4	-0.276E+00
A5	0.488E-02
A6	0.707E-03
A7	-0.461E-04
A8	0.850E-06
A9	0.000E+01

TRIM CONDITIONS

AOA	CM	CL	CD
15.1317	-0.25E-06	0.8706	.2330

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.352	0.341	0.055	0.056	0.017	0.032
-0.194	0.313	0.045	0.043	0.077	0.037
-0.035	0.282	0.034	0.035	0.173	0.044
0.130	0.245	0.032	0.033	0.300	0.054
0.278	0.208	0.037	0.036	0.000	0.000
0.416	0.172	0.044	0.043	0.000	0.000
0.548	0.134	0.056	0.054	0.000	0.000
0.673	0.095	0.087	0.000	0.000	0.000
0.727	0.078	0.113	0.000	0.000	0.000
0.764	0.066	0.136	0.000	0.000	0.000
0.809	0.051	0.173	0.000	0.000	0.000
0.825	0.045	0.190	0.000	0.000	0.000
0.852	0.000	0.220	0.000	0.000	0.000
0.871	0.000	0.245	0.000	0.000	0.000
0.893	0.000	0.278	0.000	0.000	0.000
0.873	0.000	0.247	0.000	0.000	0.000

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	0.274E+00	0.327E-01	0.340E-01	0.307E-01
A2	-0.216E+00	-0.259E-01	-0.227E-01	0.776E-01
A3	-0.747E-01	0.202E+00	0.109E+00	0.000E+01
A4	0.000E+01	-0.838E-01	0.000E+01	0.000E+01
A5	0.000E+01	-0.673E+00	0.000E+01	0.000E+01
A6	0.000E+01	0.105E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.352	-0.1629	0.4129
-0.194	-0.1865	0.4365
-0.035	-0.2103	0.4603
0.130	-0.2350	0.4850
0.278	-0.2571	0.5071
0.416	-0.2777	0.5277
0.548	-0.2974	0.5474
0.673	-0.3160	0.5660
0.727	-0.3241	0.5741
0.764	-0.3296	0.5796
0.809	-0.3363	0.5863
0.825	-0.3388	0.5888

STABILIZER -10.0 DEGREES RUDDER 0.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.29	0.356	-0.353	0.049	0.124
-2.27	0.315	-0.188	0.033	0.035
-0.24	0.250	-0.023	0.039	0.001
1.78	0.227	0.136	0.038	0.019
3.80	0.186	0.282	0.038	0.080
5.82	0.153	0.422	0.051	0.178
7.83	0.139	0.546	0.063	0.298
9.85	0.105	0.668	0.088	0.446
10.86	0.106	0.713	0.110	0.509
11.86	0.085	0.763	0.134	0.581
12.87	0.071	0.798	0.161	0.636
13.87	0.046	0.829	0.189	0.688
14.87	0.022	0.853	0.213	0.727
15.88	0.027	0.876	0.239	0.767
16.88	-0.013	0.893	0.265	0.797
17.88	0.011	0.877	0.272	0.769

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.29	0.360	-0.353	0.049	0.125
-2.27	0.304	-0.187	0.035	0.035
-0.24	0.259	-0.023	0.036	0.001
1.78	0.221	0.134	0.032	0.018
3.80	0.189	0.283	0.042	0.080
5.82	0.161	0.422	0.048	0.178
7.83	0.135	0.550	0.063	0.302
9.85	0.109	0.663	0.090	0.440
10.86	0.096	0.713	0.110	0.509
11.86	0.082	0.759	0.133	0.576
12.87	0.068	0.799	0.159	0.638
13.87	0.052	0.832	0.187	0.692
14.87	0.035	0.858	0.216	0.736
15.88	0.017	0.876	0.242	0.767
16.89	0.000	0.884	0.262	0.781
17.88	0.000	0.881	0.273	0.776

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPHA/AOA
A1	0.254E+00	-0.399E-02	0.359E-01	-0.201E-01	0.792E-01
A2	-0.201E-01	0.792E-01	0.136E-02	0.185E-02	-0.156E-02
A3	0.923E-03	-0.778E-03	0.193E-03	-0.113E-03	-0.149E-03
A4	-0.375E-04	-0.496E-04	-0.989E-04	0.000E+01	0.917E-05
A5	0.000E+01	0.229E-05	0.191E-04	0.000E+01	-0.639E-06
A6	0.000E+01	-0.128E-06	-0.674E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.29	-0.0301	0.0822
-2.27	-0.0249	0.0819
-0.24	-0.0206	0.0796
1.78	-0.0172	0.0760
3.80	-0.0147	0.0715
5.82	-0.0137	0.0662
7.83	-0.0126	0.0599
9.85	-0.0128	0.0522
10.86	-0.0133	0.0476
11.86	-0.0141	0.0425
12.87	-0.0150	0.0366
13.87	-0.0162	0.0298
14.87	-0.0176	0.0221
15.88	-0.0192	0.0131

LEAST SQUARE DATA FIT ORDER 7

DATA FIT

AOA	CM
9.85	0.105
10.86	0.107
11.86	0.087
12.87	0.065
13.87	0.047
14.87	0.033
15.88	0.013
16.88	-0.007
17.88	0.009

POLYNOMIAL COEFFICIENTS

COEF	CM/AOA
A1	0.759E+01
A2	-0.502E+01
A3	0.112E+01
A4	-0.107E+00
A5	0.337E-02
A6	0.143E-03
A7	-0.127E-04
A8	0.246E-06
A9	0.000E+01

TRIM CONDITIONS

AOA	CM	CL	CD
16.4[illegible]12	-0.9[illegible]E-07	0.852[illegible]	.25[illegible]7

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.353	0.352	0.049	0.048	0.019	0.036
-0.188	0.308	0.037	0.039	0.080	0.042
-0.023	0.266	0.034	0.035	0.178	0.051
0.136	0.226	0.038	0.036	0.298	0.063
0.282	0.190	0.044	0.042	0.000	0.000
0.422	0.157	0.050	0.051	0.000	0.000
0.546	0.128	0.060	0.063	0.000	0.000
0.668	0.101	0.088	0.000	0.000	0.000
0.713	0.091	0.107	0.000	0.000	0.000
0.763	0.080	0.136	0.000	0.000	0.000
0.798	0.073	0.163	0.000	0.000	0.000
0.829	0.066	0.193	0.000	0.000	0.000
0.853	0.000	0.218	0.000	0.000	0.000
0.876	0.000	0.248	0.000	0.000	0.000
0.893	0.000	0.271	0.000	0.000	0.000
0.877	0.000	0.249	0.000	0.000	0.000

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	0.260E+00	0.338E-01	0.346E-01	0.340E-01
A2	-0.254E+00	0.175E-01	-0.222E-02	0.957E-01
A3	0.247E-01	0.143E+00	0.976E-01	0.000E+01
A4	0.000E+01	-0.259E+00	0.000E+01	0.000E+01
A5	0.000E+01	-0.255E+00	0.000E+01	0.000E+01
A6	0.000E+01	0.800E+00	0.000E+01	0.000E+01

CL	CMCL	HN
-0.353	-0.2714	0.5214
-0.188	-0.2632	0.5132
-0.023	-0.2551	0.5051
0.136	-0.2472	0.4972
0.282	-0.2400	0.4900
0.422	-0.2331	0.4831
0.546	-0.2270	0.4770
0.668	-0.2210	0.4710
0.713	-0.2187	0.4687
0.763	-0.2163	0.4663
0.798	-0.2146	0.4646
0.829	-0.2130	0.4630

STABILIZER 6.0 DEGREES RUDDER 0.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

AOA	CM	CL	CD	CL**2
-4.79	-0.060	-0.199	0.034	0.039
-2.76	-0.097	-0.030	0.024	0.001
-0.74	-0.143	0.128	0.028	0.016
1.28	-0.189	0.298	0.034	0.089
3.30	-0.221	0.436	0.039	0.191
5.32	-0.237	0.573	0.060	0.328
7.33	-0.261	0.698	0.071	0.488
9.35	-0.283	0.819	0.110	0.670
10.36	-0.290	0.865	0.130	0.748
11.36	-0.291	0.907	0.149	0.822
12.37	-0.295	0.939	0.183	0.882
13.37	-0.313	0.969	0.208	0.939
14.37	-0.320	0.986	0.241	0.973
15.37	-0.345	0.995	0.263	0.990
16.37	-0.367	0.999	0.291	0.999
17.37	-0.346	0.988	0.311	0.976

LEAST SQUARE DATA FIT
CL, CD VS AOA, ORDER 5
CM VS AOA, ORDER 3

AOA	CM	CL	CD	CL**2
-4.79	-0.053	-0.200	0.034	0.040
-2.76	-0.106	-0.029	0.025	0.001
-0.74	-0.150	0.133	0.027	0.018
1.28	-0.185	0.289	0.034	0.084
3.30	-0.214	0.437	0.042	0.191
5.32	-0.238	0.577	0.055	0.333
7.33	-0.259	0.704	0.076	0.495
9.35	-0.277	0.815	0.108	0.664
10.36	-0.286	0.863	0.129	0.745
11.36	-0.295	0.905	0.153	0.819
12.37	-0.305	0.940	0.180	0.884
13.37	-0.314	0.968	0.208	0.937
14.37	-0.325	0.988	0.238	0.976
15.37	-0.336	0.998	0.266	0.996
16.37	0.000	0.998	0.291	0.996
17.37	0.009	0.987	0.310	0.975

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CM/AOA	CL/AOA	CD/AOA	CMALPHA/AOA	CLALPLHA/AOA
A1	-0.164E+00	0.191E+00	0.293E-01	-0.181E-01	0.776E-01
A2	-0.181E-01	0.776E-01	0.305E-02	0.184E-02	-0.165E-02
A3	0.929E-03	-0.824E-03	0.283E-03	-0.921E-04	-0.260E-04
A4	-0.307E-04	-0.868E-05	-0.429E-04	0.000E+01	-0.123E-04
A5	0.000E+01	-0.307E-05	0.124E-04	0.000E+01	0.707E-07
A6	0.000E+01	0.141E-07	-0.479E-06	0.000E+01	0.000E+01

AOA	CMALPHA	CLALPHA
-4.79	-0.0290	0.0862
-2.76	-0.0238	0.0822
-0.74	-0.0195	0.0788
1.28	-0.0159	0.0754
3.30	-0.0130	0.0714
5.32	-0.0109	0.0663
7.33	-0.0095	0.0594
9.35	-0.0089	0.0504
10.36	-0.0089	0.0449
11.36	-0.0090	0.0386
12.37	-0.0094	0.0316
13.37	-0.0099	0.0238
14.37	-0.0106	0.0151
15.37	-0.0115	0.0054

LEAST SQUARE DATA FIT

CL VS CM, 2ND ORDER
CL VS CD, 5TH ORDER
CL VS CD*, 2ND ORDER
CD VS CL**2, 1ST ORDER

CL	CM	CD	CD*	CL**2	CD
-0.199	-0.057	0.032	0.033	0.016	0.027
-0.030	-0.104	0.030	0.027	0.089	0.034
0.128	-0.145	0.021	0.027	0.191	0.044
0.298	-0.185	0.032	0.033	0.328	0.056
0.438	-0.214	0.048	0.043	0.488	0.072
0.573	-0.241	0.060	0.056	0.000	0.000
0.698	-0.263	0.070	0.072	0.000	0.000
0.819	-0.283	0.099	0.000	0.000	0.000
0.865	-0.289	0.123	0.000	0.000	0.000
0.907	-0.295	0.156	0.000	0.000	0.000
0.939	-0.300	0.191	0.000	0.000	0.000
0.969	-0.304	0.232	0.000	0.000	0.000
0.986	0.000	0.260	0.000	0.000	0.000
0.995	0.000	0.275	0.000	0.000	0.000
0.999	0.000	0.283	0.000	0.000	0.000
0.988	0.000	0.262	0.000	0.000	0.000

POLYNOMIAL COEFFICIENTS

COEF	CM/CL	CD/CL	CD*/CL	CD/CL**2
A1	-0.112E+00	0.271E-01	0.262E-01	0.254E-01
A2	-0.264E+00	-0.890E-01	-0.106E-01	0.949E-01
A3	0.679E-01	0.164E+00	0.110E+00	0.000E+01
A4	0.000E+01	0.154E+01	0.000E+01	0.000E+01
A5	0.000E+01	-0.382E+01	0.000E+01	0.000E+01
A6	0.000E+01	0.246E+01	0.000E+01	0.000E+01

CL	CMCL	HN
-0.199	-0.2909	0.5409
-0.030	-0.2680	0.5180
0.128	-0.2465	0.4965
0.298	-0.2234	0.4734
0.438	-0.2045	0.4545
0.573	-0.1861	0.4361
0.698	-0.1690	0.4190
0.819	-0.1527	0.4027
0.865	-0.1464	0.3964
0.907	-0.1407	0.3907
0.939	-0.1363	0.3863
0.969	-0.1322	0.3822

STABILIZER 0.0 DEGREES RUDDER 0.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.77	-0.014	-0.075	0.037
-4.77	-0.007	-0.046	0.033
-2.76	-0.002	-0.025	0.028
-0.76	-0.001	-0.008	0.028
1.24	0.002	0.010	0.029
3.24	0.006	0.032	0.031
5.25	0.010	0.055	0.034

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.77	-0.013	-0.072	0.037
-4.77	-0.008	-0.050	0.032
-2.76	-0.004	-0.028	0.029
-0.76	0.000	-0.007	0.028
1.24	0.003	0.014	0.028
3.24	0.006	0.034	0.031
5.25	0.009	0.053	0.035

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	0.116E-02	0.927E-03	0.280E-01
A2	0.174E-02	0.103E-01	0.132E-03
A3	-0.448E-04	-0.698E-04	0.216E-03

BETA	CNBETA	CYBETA
-6.77	0.0023	0.0112
-4.77	0.0022	0.0109
-2.76	0.0020	0.0107
-0.76	0.0018	0.0104
1.24	0.0016	0.0101
3.24	0.0015	0.0098
5.25	0.0013	0.0095

STEADY HEADING SIDESLIP ANGLE

BETA	CN	CY	CNBETA	CYBETA
-0.654	0.37E-13	-0.006	0.0018	0.0104

STABILIZER 0.0 DEGREES RUDDER 0.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.25	-0.014	-0.071	0.041
-4.25	-0.010	-0.047	0.033
-2.24	-0.003	-0.017	0.032
-0.24	0.000	-0.001	0.031
1.76	0.001	0.013	0.030
3.76	0.006	0.039	0.035
5.77	0.011	0.065	0.039

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.25	-0.014	-0.069	0.041
-4.25	-0.009	-0.046	0.035
-2.24	-0.005	-0.024	0.031
-0.24	-0.001	-0.002	0.030
1.76	0.003	0.020	0.031
3.76	0.007	0.041	0.034
5.77	0.010	0.062	0.039

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	-0.478E-03	0.717E-03	0.301E-01
A2	0.198E-02	0.109E-01	0.270E-04
A3	-0.265E-04	-0.410E-04	0.271E-03

BETA	CNBETA	CYBETA
-6.25	0.0023	0.0114
-4.25	0.0022	0.0112
-2.24	0.0021	0.0110
-0.24	0.0020	0.0109
1.76	0.0019	0.0107
3.76	0.0018	0.0106
5.77	0.0017	0.0104

STEADY HEADING SIDESLIP ANGLE

BETA	CN	CY	CNBETA	CYBETA
0.242	0.36E-12	0.003	0.0020	0.0108

STABILIZER 0.0 DEGREES RUDDER -5.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.77	-0.011	-0.076	0.034
-4.77	-0.006	-0.045	0.023
-2.76	0.000	-0.030	0.024
-0.76	0.002	-0.009	0.024
1.24	0.007	0.017	0.027
3.24	0.011	0.038	0.027
5.25	0.015	0.060	0.029

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.77	-0.011	-0.074	0.031
-4.77	-0.006	-0.051	0.027
-2.76	-0.001	-0.029	0.025
-0.76	0.003	-0.006	0.024
1.24	0.007	0.016	0.025
3.24	0.011	0.038	0.027
5.25	0.015	0.060	0.031

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	0.462E-02	0.206E-02	0.249E-01
A2	0.208E-02	0.111E-01	0.257E-03
A3	-0.347E-04	-0.165E-04	0.187E-03

BETA	CNBETA	CYBETA
-6.77	0.0025	0.0113
-4.77	0.0024	0.0112
-2.76	0.0023	0.0111
-0.76	0.0021	0.0111
1.24	0.0020	0.0110
3.24	0.0019	0.0109
5.25	0.0017	0.0109

STEADY HEADING SIDESLIP ANGLE

BETA,	CN	CY	CNBETA	CYBETA
-2.147	0.16E-12	-0.022	0.0022	0.0111

STABILIZER 0.0 DEGREES RUDDER -5.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.25	-0.008	-0.054	0.036
-4.24	-0.003	-0.034	0.031
-2.24	-0.001	-0.017	0.031
-0.24	0.001	0.002	0.030
1.76	0.005	0.022	0.028
3.77	0.010	0.050	0.034
5.77	0.014	0.068	0.039

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.25	-0.007	-0.053	0.036
-4.24	-0.004	-0.036	0.032
-2.24	-0.001	-0.017	0.030
-0.24	0.002	0.003	0.029
1.76	0.006	0.024	0.031
3.77	0.010	0.046	0.034
5.77	0.014	0.070	0.039

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	0.248E-02	0.536E-02	0.293E-01
A2	0.176E-02	0.103E-01	0.301E-03
A3	0.381E-04	0.146E-03	0.231E-03

BETA	CNBETA	CYBETA
-6.25	0.0013	0.0085
-4.24	0.0014	0.0091
-2.24	0.0016	0.0096
-0.24	0.0017	0.0102
1.76	0.0019	0.0108
3.77	0.0020	0.0114
5.77	0.0022	0.0120

STEADY HEADING SIDESLIP ANGLE

BETA	CN	CY	CNBETA	CYBETA
-1.459	-0.12E-13	-0.009	0.0016	0.0099

STABILIZER 0.0 DEGREES RUDDER -15.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.76	0.000	-0.035	0.042
-4.76	0.002	-0.019	0.034
-2.76	0.008	0.002	0.034
-0.76	0.009	0.017	0.030
1.25	0.014	0.042	0.034
3.25	0.022	0.071	0.038
5.25	0.029	0.094	0.039

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.76	0.000	-0.035	0.041
-4.76	0.003	-0.019	0.036
-2.76	0.006	-0.001	0.033
-0.76	0.010	0.020	0.032
1.25	0.015	0.043	0.033
3.25	0.021	0.068	0.036
5.25	0.029	0.095	0.041

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	0.118E-01	0.265E-01	0.322E-01
A2	0.255E-02	0.112E-01	0.344E-03
A3	0.130E-03	0.272E-03	0.239E-03

BETA	CNBETA	CYBETA
-6.76	0.0008	0.0076
-4.76	0.0013	0.0087
-2.76	0.0019	0.0097
-0.76	0.0024	0.0108
1.25	0.0029	0.0119
3.25	0.0034	0.0130
5.25	0.0039	0.0141

STABILIZER 0.0 DEGREES RUDDER -15.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.25	0.000	-0.042	0.039
-4.24	0.004	-0.021	0.029
-2.24	0.005	0.002	0.028
-0.24	0.011	0.020	0.032
1.76	0.013	0.038	0.031
3.77	0.020	0.067	0.034
5.77	0.026	0.089	0.038

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.25	0.000	-0.041	0.037
-4.24	0.003	-0.021	0.032
-2.24	0.006	-0.001	0.030
-0.24	0.010	0.020	0.029
1.76	0.015	0.042	0.030
3.77	0.020	0.065	0.034
5.77	0.026	0.089	0.039

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	0.105E-01	0.225E-01	0.290E-01
A2	0.216E-02	0.108E-01	0.222E-03
A3	0.817E-04	0.113E-03	0.253E-03

BETA	CNBETA	CYBETA
-6.25	0.0011	0.0094
-4.24	0.0015	0.0099
-2.24	0.0018	0.0103
-0.24	0.0021	0.0108
1.76	0.0025	0.0112
3.77	0.0028	0.0117
5.77	0.0031	0.0121

STEADY HEADING SIDESLIP ANGLE

BETA	CN	CY	CNBETA	CYBETA
-6.419	-0.14E-13	-0.042	0.0011	0.0094

STABILIZER 0.0 DEGREES RUDDER -25.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.76	0.010	-0.020	0.040
-4.76	0.012	-0.002	0.036
-2.76	0.015	0.015	0.036
-0.76	0.016	0.031	0.035
1.25	0.020	0.054	0.039
3.25	0.029	0.086	0.041
5.25	0.034	0.110	0.050

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.76	0.010	-0.019	0.040
-4.76	0.011	-0.004	0.037
-2.76	0.014	0.013	0.035
-0.76	0.017	0.034	0.036
1.25	0.022	0.057	0.038
3.25	0.027	0.082	0.043
5.25	0.034	0.111	0.049

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	0.166E-01	0.420E-01	0.363E-01
A2	0.222E-02	0.113E-01	0.112E-02
A3	0.146E-03	0.345E-03	0.254E-03

BETA	CNBETA	CYBETA
-6.76	0.0002	0.0066
-4.76	0.0008	0.0080
-2.76	0.0014	0.0094
-0.76	0.0020	0.0108
1.25	0.0026	0.0122
3.25	0.0032	0.0136
5.25	0.0038	0.0149

STABILIZER 0.0 DEGREES RUDDER -25.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.24	0.007	-0.021	0.047
-4.24	0.008	-0.0[illegible]1	0.045
-2.24	0.008	0.010	0.043
-0.24	0.014	0.033	0.040
1.77	0.020	0.060	0.044
3.77	0.028	0.090	0.048
5.77	0.032	0.113	0.052

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.24	0.006	-0.020	0.048
-4.24	0.008	-0.005	0.044
-2.24	0.010	0.014	0.042
-0.24	0.014	0.035	0.042
1.77	0.020	0.059	0.044
3.77	0.026	0.086	0.047
5.77	0.034	0.115	0.053

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	0.149E-01	0.377E-01	0.422E-01
A2	0.240E-02	0.114E-01	0.473E-03
A3	0.155E-03	0.346E-03	0.227E-03

BETA	CNBETA	CYBETA
-6.24	0.0005	0.0071
-4.24	0.0011	0.0085
-2.24	0.0017	0.0099
-0.24	0.0023	0.0113
1.77	0.0029	0.0126
3.77	0.0036	0.0140
5.77	0.0042	0.0154

STABILIZER 0.0 DEGREES RUDDER 5.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.77	-0.020	-0.085	0.034
-4.77	-0.014	-0.061	0.029
-2.76	-0.009	-0.038	0.028
-0.76	-0.004	-0.014	0.029
1.24	-0.002	0.003	0.029
3.24	0.001	0.028	0.034
5.25	0.006	0.051	0.035

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.77	-0.019	-0.085	0.033
-4.77	-0.014	-0.061	0.030
-2.76	-0.009	-0.039	0.029
-0.76	-0.005	-0.016	0.028
1.24	-0.001	0.006	0.030
3.24	0.002	0.028	0.032
5.25	0.005	0.050	0.036

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	-0.368E-02	-0.761E-02	0.287E-01
A2	0.193E-02	0.111E-01	0.552E-03
A3	-0.547E-04	-0.339E-04	0.175E-03

BETA	CNBETA	CYBETA
-6.77	0.0027	0.0116
-4.77	0.0025	0.0115
-2.76	0.0022	0.0113
-0.76	0.0020	0.0112
1.24	0.0018	0.0110
3.24	0.0016	0.0109
5.25	0.0014	0.0108

STEADY HEADING SIDESLIP ANGLE

BETA	CN	CY	CNBETA	CYBETA
2.018	-0.18E-13	0.015	0.0017	0.0110

STABILIZER 0.0 DEGREES RUDDER 5.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.25	-0.016	-0.084	0.038
-4.25	-0.011	-0.051	0.032
-2.24	-0.005	-0.024	0.029
-0.24	-0.004	-0.012	0.029
1.76	-0.002	0.004	0.029
3.76	0.002	0.027	0.030
5.77	0.007	0.049	0.033

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.25	-0.015	-0.080	0.037
-4.25	-0.011	-0.055	0.033
-2.24	-0.007	-0.031	0.030
-0.24	-0.004	-0.010	0.028
1.76	0.000	0.011	0.028
3.76	0.003	0.029	0.030
5.77	0.006	0.046	0.033

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	-0.323E-02	-0.705E-02	0.284E-01
A2	0.176E-02	0.103E-01	-0.258E-03
A3	-0.291E-04	-0.207E-03	0.183E-03

BETA	CNBETA	CYBETA
-6.25	0.0021	0.0129
-4.25	0.0020	0.0121
-2.24	0.0019	0.0113
-0.24	0.0018	0.0104
1.76	0.0017	0.0096
3.76	0.0015	0.0088
5.77	0.0014	0.0079

STEADY HEADING SIDESLIP ANGLE

BETA	CN	CY	CNBETA	CYBETA
1.890	0.22E-12	0.012	0.0017	0.0096

STABILIZER 0.0 DEGREES RUDDER 15.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.77	-0.027	-0.107	0.042
-4.77	-0.020	-0.080	0.035
-2.77	-0.015	-0.055	0.028
-0.76	-0.010	-0.033	0.026
1.24	-0.009	-0.017	0.023
3.24	-0.006	0.006	0.023
5.24	-0.003	0.025	0.029

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.77	-0.026	-0.106	0.042
-4.77	-0.021	-0.081	0.034
-2.77	-0.015	-0.057	0.028
-0.76	-0.011	-0.035	0.025
1.24	-0.008	-0.014	0.024
3.24	-0.005	0.006	0.025
5.24	-0.004	0.024	0.028

LEAST SQUARE POLYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	-0.986E-02	-0.264E-01	0.241E-01
A2	0.174E-02	0.106E-01	-0.767E-03
A3	-0.105E-03	-0.176E-03	0.281E-03

BETA	CNBETA	CYBETA
-6.77	0.0032	0.0129
-4.77	0.0027	0.0122
-2.77	0.0023	0.0115
-0.76	0.0019	0.0108
1.24	0.0015	0.0101
3.24	0.0011	0.0094
5.24	0.0006	0.0087

STABILIZER 0.0 DEGREES RUDDER 15.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.25	-0.028	-0.103	0.044
-4.25	-0.027	-0.072	0.040
-2.25	-0.016	-0.049	0.037
-0.24	-0.010	-0.025	0.034
1.76	-0.007	-0.009	0.033
3.76	-0.006	0.010	0.036
5.76	-0.002	0.027	0.038

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.25	-0.028	-0.102	0.044
-4.25	-0.022	-0.074	0.039
-2.25	-0.016	-0.049	0.036
-0.24	-0.011	-0.026	0.034
1.76	-0.008	-0.006	0.034
3.76	-0.005	0.011	0.035
5.76	-0.003	0.026	0.038

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEFF	CN/BETA	CY/BETA	CD/BETA
A1	-0.108E-01	-0.238E-01	0.343E-01
A2	0.203E-02	0.105E-01	-0.447E-03
A3	-0.116E-03	-0.324E-03	0.181E-03

BETA	CNBETA	CYBETA
-6.25	0.0035	0.0145
-4.25	0.0030	0.0132
-2.25	0.0026	0.0120
-0.24	0.0021	0.0107
1.76	0.0016	0.0094
3.76	0.0012	[illegible]
5.76	0.0007	[illegible]

STABILIZER 0.0 DEGREES RUDDER 25.0 DEGREES

BASIC CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.78	-0.035	-0.124	0.049
-4.77	-0.029	-0.096	0.040
-2.77	-0.022	-0.064	0.038
-0.77	-0.015	-0.040	0.036
1.24	-0.013	-0.023	0.036
3.24	-0.010	-0.004	0.036
5.24	-0.008	0.013	0.040

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.78	-0.035	-0.124	0.048
-4.77	-0.028	-0.094	0.042
-2.77	-0.021	-0.066	0.038
-0.77	-0.016	-0.042	0.035
1.24	-0.012	-0.021	0.035
3.24	-0.010	-0.003	0.036
5.24	-0.008	0.012	0.040

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	-0.143E-01	-0.336E-01	0.350E-01
A2	0.260E-02	0.107E-01	-0.305E-03
A3	-0.162E-03	-0.395E-03	0.239E-03

BETA	CNBETA	CYBETA
-6.78	0.0042	0.0161
-4.77	0.0035	0.0145
-2.77	0.0029	0.0129
-0.77	0.0022	0.0113
1.24	0.0016	0.0097
3.24	0.0009	0.0081
5.24	0.0003	0.0066

STABILIZER 0.0 DEGREES RUDDER 25.0 DEGREES

ARIA CONFIGURATION

CORRECTED DATA

BETA	CN	CY	CD
-6.25	-0.035	-0.117	0.051
-4.25	-0.027	-0.092	0.041
-2.25	-0.022	-0.064	0.038
-0.24	-0.014	-0.039	0.037
1.76	-0.010	-0.020	0.034
3.76	-0.011	-0.004	0.038
5.76	-0.008	0.012	0.042

LEAST SQUARE DATA FIT, ORDER 2

BETA	CN	CY	CD
-6.25	-0.035	-0.118	0.050
-4.25	-0.027	-0.090	0.043
-2.25	-0.021	-0.064	0.038
-0.24	-0.015	-0.041	0.035
1.76	-0.012	-0.021	0.035
3.76	-0.009	-0.003	0.037
5.76	-0.008	0.011	0.042

LEAST SQUARE PLOYNOMIAL COEFFICIENTS

COEF	CN/BETA	CY/BETA	CD/BETA
A1	-0.149E-01	-0.323E-01	0.351E-01
A2	0.217E-02	0.106E-01	-0.532E-03
A3	-0.168E-03	-0.343E-03	0.306E-03

BETA	CNBETA	CYBETA
-6.25	0.0043	0.0149
-4.25	0.0036	0.0135
-2.25	0.0029	0.0122
-0.24	0.0023	0.0108
1.76	0.0016	0.0094
3.76	0.0009	0.0080
5.76	0.0002	0.0067

APPENDIX F

C-18 VS C-135 Dimensions

	C-18	C-135
LENGTH	152 ft 11 in	134 ft 9 in
WING SPAN	145 ft 9 in	130 ft 10 in
WING AREA	3010 sq ft	2433 sq ft
TAIL PLANE SPAN	45 ft 8 in	39 ft 8 in
TAIL PLANE AREA	625 sq ft	500 sq ft
MAC	272.29 in	241.88 in
FIN AREA	328 sq ft	328 sq ft

VITA

David M. Sprinkel was born on 26 August 1948 in Lafayette, Indiana. He received a Bachelor of Science Degree in basic science and his commission from the U.S. Air Force Academy on 3 June 1970. He attended pilot training and was then assigned to C-141A and later C-5A pilot duty until 1977. He then attended the U.S. Air Force Test Pilot School at Edwards AFB and served as a test pilot until he was assigned to AFIT in May 1981.

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

C-18 Aircraft
Advanced Range Instrumentation Aircraft
Wind Tunnel Test

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Air Force intends to modify Boeing 707-320C aircraft (Air Force designation, C-18) with the large blunt nosed Advance Range Instrumentation Aircraft (ARIA) radome formerly installed on EC-135 aircraft. This modification will significantly increase fuselage area forward of the aircraft center of gravity and is expected to reduce longitudinal and directional stability, and increase drag. These anticipated aerodynamic changes were evaluated from data